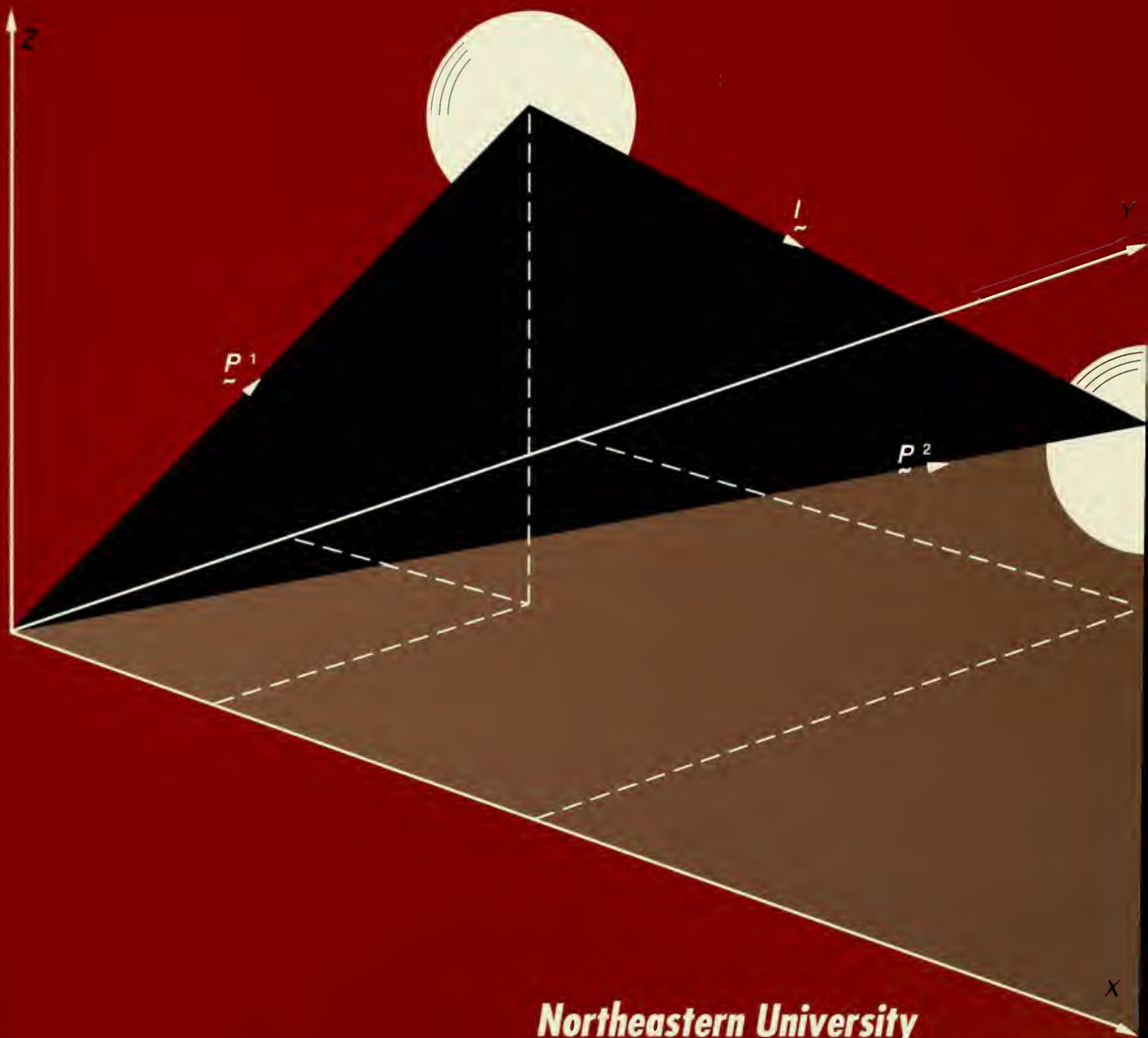



School of Engineering Technology

Bulletin 1994 | 1996





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Northeastern University

School of Engineering Technology

Academic Calendar 1994-1995

Fall Quarter 1994

Registration		Tuesday-Wednesday, September 6-14
Fall quarter classes begin		Monday, September 26
Columbus Day observed	No classes	Monday, October 10
Veterans Day observed	No classes	Friday, November 11
Thanksgiving recess	No classes	Thursday-Saturday, November 24-26
Final examination period for fall quarter		Monday-Saturday, December 12-17
Christmas vacation	No classes	Monday-Saturday, December 19-December 31

Winter Quarter 1995

Registration		Monday-Thursday, December 5-8
Winter quarter classes begin		Tuesday, January 3
Martin Luther King, Jr.'s Birthday observed	No classes	Monday, January 16
Presidents Day observed	No classes	Monday, February 20
Final examination period for winter quarter		Monday-Saturday, March 20-25
Spring recess (or makeup period for snow days)		Monday-Saturday, March 27-April 1

Spring Quarter 1995

Registration		Monday-Thursday, March 13-16
Spring quarter classes begin		Monday, April 3
Patriots Day observed	No classes	Monday, April 17
Memorial Day observed	No classes	Monday, May 29
Final examination period for spring quarter		Monday-Saturday, June 12-17
Commencement		Saturday, June 17

Northeastern University

School of Engineering Technology

Registration Schedule 1994-1995

Each day listed in the Registration Schedule is followed by a letter code in parentheses. This code indicates the registration times for that particular day. A key for the codes is printed on the last line of the schedule.

Place of Registration	Fall 1994	Winter 1995	Spring 1995	Summer 1995
Boston Main campus*	Tuesday- Friday(b) September 6-9 Saturday(a) September 10 Monday- Wednesday(b) September 12-14	Monday- Thursday(b) December 5-8	Monday- Thursday(b) March 13-16	Registration for entire summer quarter Monday- Thursday(b) June 5-8 Registration for second five-week term Monday- Tuesday(b) July 10-11
Burlington campus*	Wednesday- Thursday(c) September 7-8 Monday- Tuesday(c) September 12-13	Monday- Wednesday(c) December 5-7	Monday- Wednesday(c) March 13-15	Registration for entire summer quarter Monday- Wednesday(c) June 5-7 Registration for second five-week term Monday July 10(c)
Dedham campus*	Thursday(c) September 8 and Monday(c) September 12	Monday- Wednesday(c) December 5-7	Monday- Wednesday(c) March 13-15	
Downtown Boston campus	Tuesday- Thursday(d) September 6-8 Monday- Tuesday(d) September 12-13	Monday- Wednesday(d) December 5-7	Monday- Wednesday(d) March 13-15	

Registration Schedule Continued

(See reverse side for Academic Calendar and Fee Schedule.)

Place of Registration	Fall 1994	Winter 1995	Spring 1995
Framingham High School	Tuesday(c) September 6 Monday(c) September 12	Monday- Tuesday(c) December 5-6	Monday- Tuesday(c) March 13-14
Malden High School	Wednesday(c) September 7 and Monday(c) September 12	Monday(c) December 5	Monday(c) March 13
Marlborough High School*	Wednesday(c) September 7 and Monday(c) September 12	Monday(c) December 5	Monday(c) March 13
Marshfield High School	Thursday(c) September 8 Tuesday(c) September 13	Tuesday(c) December 6	Tuesday(c) March 14
Milford High School	Thursday(c) September 8 Tuesday(c) September 13	Tuesday(c) December 6	Tuesday(c) March 14
Westwood High School	Tuesday(c) September 6 Tuesday(c) September 13	Monday- Wednesday(c) December 5-7	Monday- Wednesday(c) March 13-15
Weymouth Junior High School	Wednesday(c) September 7 Monday(c) September 12	Monday- Wednesday(c) December 5-7	Monday- Wednesday(c) March 13-15

(a)9:00 AM-Noon (b)9:30 AM-7:00 PM (c)5:30 PM-7:30 PM (d)11:00 AM-7:00 PM

*Counselors available at these locations only.

Summer Quarter 1995

Registration for entire quarter		Monday-Thursday, June 5-8
Summer quarter classes begin		Monday, June 19
Independence Day observed		Tuesday, July 4
Registration for second five-week term		Monday-Tuesday, July 10-11
Second summer quarter begins		Monday, July 24
Labor Day observed	No classes	Monday, September 4
Final examination period for summer quarter		Held during last class session each term

Fee Schedule

Tuition Related Fees

Fee

Tuition*	\$170.00 per quarter hour
Late payment fee	\$ 75.00
Student Center fee (main campus only)	\$ 8.25 per quarter

*University College courses are offered at \$150.00 per quarter hour.

Other Fees

Fee

Makeup final exam fee	\$50.00
Official transcript fee	\$ 2.00 per copy
Parking decal fee	\$40.00 per year
Proficiency examination fee	\$50.00
Registration fee (first-time students only)	\$10.00

**Northeastern
University**

**School of
Engineering Technology**

**Bulletin
1994–1996**

**120 Snell Engineering Center
Boston, Massachusetts 02115**

**Telephone: 617-373-2500
Fax: 617-373-2501**

About the cover.

The cover shows a complex graph depicting collision avoidance based on two spheres. "Real-time collision avoidance in two-armed robotic systems," R. G. Beaumont and R. M. Crowder. *Computer-Aided Engineering Journal*, Vol. 8, No. 6, December 1991. Used by permission. IEE Publishing Department, Michael Faraday House, Six Hills Way, Stevenage, Herts., England.

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About This Bulletin

This *Bulletin* offers information about the evening and weekend programs available at Northeastern University's School of Engineering Technology. (If you are interested in Northeastern University's full-time day programs, call the Office of Undergraduate Admissions, 617-373-2200.)

For prospective students, we hope that after reading this publication you'll agree that a career in engineering technology can be exciting and challenging. As you'll soon discover, our evening and weekend programs are designed to enable you to pursue a career and an education at the same time.

Students already attending the School of Engineering Technology use the *Bulletin* as an important guide to the resources and policies of the University. In addition, students use the degree program descriptions to plan and track their academic careers.

The *School of Engineering Technology Bulletin* is divided into two parts: "Teaching Tomorrow's Technologists Today" and "Northeastern University."

"Teaching Tomorrow's Technologists Today" defines engineering technology and introduces you to the School of Engineering Technology. This section also contains descriptions of each program and course we offer.

The "Northeastern University" section reviews the benefits—the services and resources—that attending a large private university provides. We present the University's administrative and academic policies, as well as financial aid and scholarship opportunities.

Taking the Next Step

Because the evening and weekend technology programs have an open enrollment policy, you can register for courses without formally applying for admittance to a program. In fact, our students earn sixteen credits before petitioning for entrance to a program. For more details, carefully review the "Admissions" section. (See page 57.)

A Fee Schedule and Academic Calendar should have been enclosed with this *Bulletin*. The insert includes the current academic calendar, registration dates, and a list of the University's fees.

Before registration begins, obtain a copy of the *University College and School of Engineering Technology Schedule* for the next academic quarter. The *Schedule* indicates which courses will be offered each quarter, as well as when and where they will meet. Note that, since not all courses are offered every quarter, you must plan your course load for the coming academic year, not just the next quarter, by referring to the program and course descriptions contained in this *Bulletin* and obtaining a copy of the *Tentative Part-Time Schedule* published annually. For more details, review the "Registration" section. (See page 59.)

Finding Additional Help

If you have any questions, or are missing any of the forms mentioned in this *Bulletin*, call the School of Engineering Technology office, 617-373-2500.

Teaching Tomorrow's Technologists Today

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An Introduction to Engineering Technology

What is engineering technology?

Engineering technology is the application of engineering principles and modern technology to help solve or prevent technical problems.

Engineering technology is a relatively new discipline. Before engineering technology programs like Northeastern's emerged, people with scientific or technical ambitions had a difficult decision to make: what kind of education should they pursue? College-bound students had three choices.

Choice number one was selecting a major from among the pure sciences: physics, chemistry, or biology. However, these majors are only appropriate for people interested in pursuing additional degrees, laboratory research, or careers in education.

The second choice was selecting from among the engineering science majors: civil engineering, electrical engineering, or mechanical engineering. But engineering requires highly developed analytical skills, and prepares people for careers conceptualizing and designing technical devices or systems.

The third choice was deciding not to attend college, but to enroll in a technical or vocational school. This route is best suited for people interested in the trades: that is, for people who want careers physically building or repairing machinery.

Engineering technology curricula introduced a fourth option. The programs are designed to meet the growing need created by the technological revolution for college-educated problem solvers who can support the engineering process by bridging the gap between the blueprints and the production line. These men and women can help engineers and tradespeople work effectively together.

Engineering technology programs include scientific and engineering principles relevant to your chosen field: you will come to understand why a system is designed in a particular fashion and how it works. This educational focus is often absent from a technical or vocational school education.

In addition, engineering technology students acquire hands-on technical skills that enable them to solve production and system implementation problems, and help them explain solutions to tradespeople.

Who are engineering technologists?

People who are part of the technology workplace include scientists, engineers, technologists, technicians, and tradespeople. All of these people have specialized education or training beyond the high-school level and often work together as a team. As on any team, the players have different but important roles.

Scientists are concerned with advancing our understanding of the laws of nature and our knowledge of scientific principles. The scientist is primarily involved with research.

Engineers employ the scientific knowledge developed by scientists in planning, designing, and constructing technical devices and systems. The engineer is a developer of technological innovations.

Engineering technologists work closely with engineers in coordinating people, material, and machinery in order to achieve the specific goals of a particular project. The engineering technologist often ensures that the engineer's designs and instructions are implemented efficiently and according to accepted practices.

School of Engineering Technology

You have a special kind of ambition that allows you to work full-time and attend the University after hours. The faculty and administration of the School of Engineering Technology share, admire, and respect your desire for professional and personal growth through higher education. We are as committed as you. We can help you achieve your goals.

When you enroll in the School of Engineering Technology, you are entering one of the oldest and finest undergraduate engineering technology programs in the country. Northeastern University established its first engineering technology program within the Polytechnic School in 1916. During 1926, the program was reorganized under a new entity within Northeastern: Lincoln Institute, later changed to Lincoln College. The program's most recent transformation occurred in 1984, when Lincoln College became the School of Engineering Technology.

Today's School of Engineering Technology is a unit of Northeastern University's College of Engineering. Although we offer courses at several locations and through the University's television system, Network Northeastern, our central offices are in the Snell Engineering Center on the Boston campus.

All of our engineering technology programs require laboratory courses that are conducted in facilities on the Boston campus. We've done our best to ensure that you can get the most out of these courses by equipping our laboratories with the latest available technology. We continue to acquire laboratory equipment that allows us to conduct experiments that were until recently impractical or impossible.

As a student at Northeastern's School of Engineering Technology, you are taught by

faculty whose impressive professional experience can provide you with practical insights into the field.

In addition to the many resources offered to you as a School of Engineering Technology student, you are a fully vested member of the Northeastern University community. As such, you are invited to take advantage of the many assets the University provides. We encourage you to read the "Profile of Northeastern" section of this *Bulletin* for details of the University's facilities.

The School of Engineering Technology offers day programs in engineering technology to full-time students, as well as the evening and weekend programs described in this publication. All of our programs are at the undergraduate level, leading to an associate's, bachelor's or minor degree, or to a certificate.

Our evening and weekend degree programs span the following areas of concentration.

- Civil engineering technology, including environmental, structural, and surveying and highway engineering technology
- Computer technology
- Electrical engineering technology
- Manufacturing engineering technology
- Mechanical engineering technology, including aerospace maintenance engineering technology
- Telecommunications

We welcome your interest in Northeastern's School of Engineering Technology. In the following pages, you can learn about the specifics of each of our programs.

Program Descriptions

Overview

This section gives a description of each program offered by the School of Engineering Technology. Accompanying each description are specimen curricula for the majors offered within the specific program. The specimens list the degree's required courses and the sequence in which you should complete them. The specimens assume that you will initially enroll in courses during the fall quarter. If you are a transfer student, take

time off, or begin the program in a different quarter, please meet with one of our academic advisers. The adviser will help you take courses in a sequence that is academically sound and that will fulfill your degree program's graduation requirements. For more information about the program descriptions and curricula, contact an adviser at 617-373-2500.

Civil Engineering Technology Programs

Civil engineering professionals plan and construct a variety of structures and public works. The civil engineering technologist's major functions as a member of the technical team include: preparing surveys (topographical, geological, traffic); designing structures (buildings, bridges, dams); planning municipal systems (water, sewers, flood control); and developing transportation facilities (highways, railways, waterways).

We offer associate's degree programs with majors in environmental engineering technology; structural engineering technology; and surveying and highway engineering technology.

The associate's degree program in environmental engineering technology offers you the opportunity to prepare for responsibilities related to designing, constructing, and supervising municipal plants and systems that control the storage and distribution of water. Students may also prepare for responsibilities associated with the disposal of sewage and waste in urban areas, with an emphasis on preventing contamination and pollution. Career opportunities are with town, city, and state public works depart-

ments, private engineering consultants, architects, contractors, and engineering firms.

The associate's degree program in structural engineering technology offers the opportunity to prepare for planning, designing, and supervising the construction of buildings, bridges, foundations, flood-control projects, and other fixed structures. Professional opportunities include consulting engineering firms, architectural groups, contractors, railroads, government agencies, and the military.

The associate's degree program in surveying and highway engineering technology offers opportunities in the preparation and calculation of preliminary and legal surveys required for both basic and complex projects. These projects can include subdivision work, individual lot layouts, highway layouts, and projects relating to sewer systems, pipelines, power transmission lines, dams, reservoirs, and aqueducts. Career opportunities are with independent surveying companies, civil engineering companies, highway transit, railroad planning groups, cartographers, construction companies, and contractors.

Environmental Engineering Technology

(Major Code 011)

The Environmental Engineering Technology Program leads to the associate in engineering degree. Degree candidates must

earn 103 credits by completing the following four-year curriculum.

First-Year Courses	Fall	GET	4170	Engineering Graphics 1
		MTH	4107	College Algebra
	Winter	GET	4171	Engineering Graphics 2
		MTH	4108	Pre-Calculus
	Spring	GET	4100	Computer Programming for Engineering Technology
		MTH	4120	Calculus 1
Second-Year Courses	Fall	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	Winter	ENG	4100	Critical Writing 1
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	Spring	GET	4306	Technical Communications
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	Fall	CHM	4130	Chemical Principles 1
		ECN	4115	Economic Principles and Problems 1
		MET	4301	Mechanics A
	Winter	ECN	4116	Economic Principles and Problems 2
		ENG	4111	Critical Writing 2
		MET	4314	Stress Analysis A
	Spring	MET	4315	Stress Analysis B
		MET	4370	Fluid Mechanics A
Fourth-Year Courses	Fall	CET	4324	Structural Analysis 1
		CET	4361	Materials and Soil Mechanics
	Winter	CET	4350	Environmental 1
		CET	4371	Concrete Design 1
	Spring	CET	4351	Environmental 2
		CET	4393	Construction Administration

Structural Engineering Technology

(Major Code 012)

The Structural Engineering Technology Program leads to the associate in engineering degree.

Degree candidates must earn 103 credits by completing the following four-year curriculum.

First-Year Courses	Fall	GET	4170	Engineering Graphics 1
		MTH	4107	College Algebra
	Winter	GET	4171	Engineering Graphics 2
		MTH	4108	Pre-Calculus
	Spring	GET	4100	Computer Programming for Engineering Technology
		MTH	4120	Calculus 1
Second-Year Courses	Fall	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	Winter	ENG	4100	Critical Writing 1
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	Spring	GET	4306	Technical Communications
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	Fall	CHM	4130	Chemical Principles 1
		ECN	4115	Economic Principles and Problems 1
		MET	4301	Mechanics A
	Winter	ECN	4116	Economic Principles and Problems 2
		ENG	4111	Critical Writing 2
		MET	4314	Stress Analysis A
	Spring	CET	4321	Introduction to Structural Design
		MET	4315	Stress Analysis B
Fourth-Year Courses	Fall	CET	4324	Structural Analysis 1
		CET	4361	Materials and Soil Mechanics
	Winter	CET	4325	Structural Analysis 2
		CET	4371	Concrete Design 1
	Spring	CET	4331	Steel Design 1
		CET	4393	Construction Administration

Surveying and Highway Engineering Technology (Major Code 013)

The Surveying and Highway Engineering Technology Program leads to the associate in engineering degree. Degree candidates must

earn 103 credits by completing the following four-year curriculum.

First-Year Courses	<i>Fall</i>	GET	4170	Engineering Graphics 1
		MTH	4107	College Algebra
	<i>Winter</i>	GET	4171	Engineering Graphics 2
		MTH	4108	Pre-Calculus
	<i>Spring</i>	GET	4100	Computer Programming for Engineering Technology
		MTH	4120	Calculus 1
Second-Year Courses	<i>Fall</i>	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	<i>Winter</i>	ENG	4100	Critical Writing 1
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	<i>Spring</i>	GET	4306	Technical Communications
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	<i>Fall</i>	CHM	4130	Chemical Principles 1
		ECN	4115	Economic Principles and Problems 1
		MET	4301	Mechanics A
	<i>Winter</i>	ECN	4116	Economic Principles and Problems 2
		ENG	4111	Critical Writing 2
		MET	4314	Stress Analysis A
	<i>Spring</i>	MET	4315	Stress Analysis B
		MET	4370	Fluid Mechanics A
Fourth-Year Courses	<i>Fall</i>	CET	4301	Plane Surveying
		CET	4316	Land Use Planning
	<i>Winter</i>	CET	4302	Geodetic Surveying
		CET	4307	Legal Aspects of Surveying
	<i>Spring</i>	CET	4303	Route Surveying
		CET	4311	Highway Engineering

Computer Technology Programs

The computer technology professional's work relates to the design and use of computer system hardware and software. Areas of study include the design and architecture of the computer system; software issues include the methodology and application of problem solving and the utilization of hardware.

We offer both an associate's and a bachelor's degree program in computer technology.

The associate's degree program in computer technology offers you the opportunity to understand the mathematical and technological foundations of both hardware and software. In addition to providing a more thorough

study of hardware and software, the bachelor's degree program gives you the opportunity to specialize in a specific area through five required technical electives.

Career opportunities may include computer programming for engineering, science, and business. Additional employment opportunities concern designing, engineering, and testing of computers; and interfacing computers with various types of equipment used in automation. Associate's degree graduates may qualify for entry-level positions in the areas listed, while bachelor's degree graduates may secure employment with more responsibility.

Computer Technology (Major Code 036)

The Computer Technology Program leads to the associate in engineering degree. Degree candidates must earn 102 credits by completing the following four-year curriculum.

First-Year Courses	Fall	CT	4150	Computer Organization
		MTH	4107	College Algebra
	Winter	GET	4100	Computer Programming for Engineering Technology
		MTH	4108	Pre-Calculus
	Spring	ENG	4100	Critical Writing 1
		MTH	4120	Calculus 1
Second-Year Courses	Fall	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	Winter	GET	4170	Engineering Graphics 1
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	Spring	GET	4306	Technical Communications
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	Fall	EET	4151	Circuit Analysis 1
		MTH	4122	Calculus 3
	Winter	CT	4311	Programming with the C Language
		EET	4152	Circuit Analysis 2
	Spring	ECN	4115	Economic Principles and Problems 1
		ENG	4111	Critical Writing 2
		()		Social Science/Humanities Elective
Fourth-Year Courses	Fall	CT	4345	Assembly Language
		CT	4368	Semiconductor Logic
	Winter	CT	4330	Data Structures
		CT	4369	Computer Logic
	Spring	CT	4374	Introduction to CPU Hardware
		CT	4381	Operating Systems
		()		Social Science/Humanities Elective

Computer Technology (Major Code 037)

The Computer Technology Program leads to the bachelor of science in engineering technology degree. Degree candidates must earn at least

183 credits by completing the following seven-year curriculum.

First-Year Courses	Fall	CT	4150	Computer Organization
		MTH	4107	College Algebra
	Winter	GET	4100	Computer Programming for Engineering Technology
		MTH	4108	Pre-Calculus
	Spring	ENG	4100	Critical Writing 1
		MTH	4120	Calculus 1
Second-Year Courses	Fall	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	Winter	GET	4170	Engineering Graphics 1
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	Spring	GET	4306	Technical Communications
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	Fall	EET	4151	Circuit Analysis 1
		MTH	4122	Calculus 3
	Winter	CT	4311	Programming with the C Language
		EET	4152	Circuit Analysis 2
	Spring	ECN	4115	Economic Principles and Problems 1
		ENG	4111	Critical Writing 2
		()		Social Science/Humanities Elective
Fourth-Year Courses	Fall	CT	4345	Assembly Language
		CT	4368	Semiconductor Logic
	Winter	CT	4330	Data Structures
		CT	4369	Computer Logic
	Spring	CT	4374	Introduction to CPU Hardware
		CT	4381	Operating Systems
		()		Social Science/Humanities Elective

Fifth-Year Courses	<i>Fall</i>	CT	4335	Numerical Methods
		CT	4375	CPU Architecture
	<i>Winter</i>	CT	4355	Micro Peripheral Hardware
		()		Technical Elective
	<i>Spring</i>	CT	4340	Software Engineering Design
		CT	4380	Data Communication Methods
Sixth-Year Courses	<i>Fall</i>	CT	4356	Complex Peripheral Hardware
		CT	4480	Local Area Networks 1
	<i>Winter</i>	CMN ()		Communication Elective
		CT	4351	Advanced Computer Organization
		()		Social Science/Humanities Elective
	<i>Spring</i>	CMN ()		Communication Elective
		()		Social Science/Humanities Elective
		()		Technical Elective
Seventh-Year Courses	<i>Fall</i>	CT	4360	Industry Software
		()		Open Elective*
		()		Technical Elective
	<i>Winter</i>	CT	4365	Industry Hardware
		()		Technical Elective
	<i>Spring</i>	()		Social Science/Humanities Elective
		()		Social Science/Humanities Elective
		()		Technical Elective
Suggested Technical Electives	CT	4321	Programming with Ada	
	CT	4348	LISP	
	CT	4363	Concurrent Programming	
	CT	4377	VLSI Design	
	CT	4382	Computer Graphics Programming	
	CT	4383	Databases	
	CT	4384	Large System Assembly Languages	
	CT	4387	Bit Slice Microcomputers	
	CT	4389	Single-Chip Microprocessors	
	CT	4390	Special Problems in Computer Technology	
	CT	4393	UNIX Operating System	
	CT	4394	Object Oriented Programming	
	CT	4395	Computer Security	
	CT	4396	PROLOG: An Introduction to Artificial Intelligence	
	CT	4397	Advanced UNIX Programming	
	CT	4470	Introduction to X Windows	
	CT	4475	Concurrent Engineering and Design Testability	
	CT	4481	Local Area Networks 2	

*Open Elective can be a three or four quarter-hour course.

Electrical Engineering Technology Programs

Electrical engineering technologists consider the design and operation of equipment and systems related to communications, data processing, electrical control, and power. In the power utility field, for example, the electrical engineering technologist is responsible for the generation, transmission, and distribution of electricity for light and power.

We offer both an associate's and a bachelor's degree program in electrical engineering technology.

The associate's degree program in electrical engineering technology relates to the design, development, and operation of communications, data processing, and electronic control equipment. The equipment is applied to computers, military and space explorations, and automated industrial production equipment. The bachelor's

degree program, in addition, relates to the installation and production of a variety of electrical and electronic equipment. Fields in which such equipment is applied include communications, data processing, industry, and in generating and utilizing electricity.

Career opportunities for associate's degree graduates include entry-level positions related to communications and electrical equipment, equipment manufacturing, and data processing and control. Career opportunities for bachelor's degree graduates are in public and private research laboratories; engineering consulting firms specializing in industrial and plant applications; electric utilities; and organizations concerned with the operation, manufacture, installation, or sale of electrical or electronic systems and equipment.

Electrical Engineering Technology

(Major Code 033)

The Electrical Engineering Technology Program leads to the associate in engineering degree. The program is accredited by the Technology Accreditation Commission of the Accreditation

Board for Engineering and Technology. Degree candidates must earn at least 105 credits by completing the following four-year curriculum.

First-Year Courses	Fall	GET	4170	Engineering Graphics 1
		MTH	4107	College Algebra
	Winter	GET	4171	Engineering Graphics 2
		MTH	4108	Pre-Calculus
	Spring	GET	4100	Computer Programming for Engineering Technology
		MTH	4120	Calculus 1
Second-Year Courses	Fall	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	Winter	ENG	4100	Critical Writing 1
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	Spring	GET	4306	Technical Communications
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	Fall	EET	4151	Circuit Analysis 1
		MTH	4122	Calculus 3
	Winter	EET	4124	Circuits Lab 1
		EET	4152	Circuit Analysis 2
		MTH	4123	Differential Equations*
	Spring	EET	4125	Circuits Lab 2
		ENG	4111	Critical Writing 2
		()		Social Science/Humanities Elective
Fourth-Year Courses	Fall	EET	4311	Electronics 1
		EET	4353	Circuit Analysis 3*
		()		Social Science/Humanities Elective
	Winter	EET	4312	Electronics 2
		EET	4354	Circuit Analysis 4*
	Spring	EET	4310	Electrical Measurements
		EET	4313	Electronics 3
		EET	4323	Electronics Lab

*Students not planning to enter a bachelor's degree program after graduation can substitute a social science/humanities elective for MTH 4123 Differential Equations; EET 4314 Pulse and Digital 1 for EET 4353 Circuit Analysis 3; and an approved technical elective for EET 4354 Circuit Analysis 4.

Electrical Engineering Technology

(Major Code 035)

The Electrical Engineering Technology Program leads to the bachelor of science in engineering technology degree. The program is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology. Degree candidates must earn at least 186 credits by completing the following seven-year curriculum.

First-Year Courses	Fall	GET	4170	Engineering Graphics 1
		MTH	4107	College Algebra
	Winter	GET	4171	Engineering Graphics 2
		MTH	4108	Pre-Calculus
	Spring	GET	4100	Computer Programming for Engineering Technology
		MTH	4120	Calculus 1
Second-Year Courses	Fall	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	Winter	ENG	4100	Critical Writing 1
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	Spring	GET	4306	Technical Communications
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	Fall	EET	4151	Circuit Analysis 1
		MTH	4122	Calculus 3
	Winter	EET	4124	Circuits Lab 1
		EET	4152	Circuit Analysis 2
		MTH	4123	Differential Equations
	Spring	EET	4125	Circuits Lab 2
		ENG	4111	Critical Writing 2
		()		Social Science/Humanities Elective
Fourth-Year Courses	Fall	EET	4311	Electronics 1
		EET	4353	Circuit Analysis 3
		()		Social Science/Humanities Elective
	Winter	EET	4312	Electronics 2
		EET	4354	Circuit Analysis 4
	Spring	EET	4310	Electrical Measurements
		EET	4313	Electronics 3
		EET	4323	Electronics Lab

Fifth-Year Courses

<i>Fall</i>	CMN ()	Communication Elective
	EET 4314	Pulse and Digital 1
	EET 4327	Advanced Electronics Lab 1*
<i>Winter</i>	CMN ()	Communication Elective
	EET 4328	Advanced Electronics Lab 2*
	EET ()	Technical Elective
<i>Spring</i>	EET 4329	Advanced Electronics Lab 3*
	EET 4330	Energy Conversion
	MET 4319	Mechanics

Sixth-Year Courses

<i>Fall</i>	EET 4370	Digital Computers 1
	()	Open Elective [†]
	()	Social Science/Humanities Elective
<i>Winter</i>	EET 4371	Digital Computers 2
	()	Social Science/Humanities Elective
	()	Social Science/Humanities Elective
<i>Spring</i>	EET 4337	Distributed Systems
	EET ()	Technical Elective

Seventh-Year Courses

<i>Fall</i>	EET ()	Technical Elective
	()	Social Science/Humanities Elective
<i>Winter</i>	EET 4377	Control Engineering 1
	EET ()	Technical Elective
	()	Social Science/Humanities Elective
<i>Spring</i>	EET 4378	Control Engineering 2
	()	Social Science/Humanities Elective

Suggested Technical Electives

CT	4311	Programming with the C Language
CT	4374	Introduction to CPU Hardware
CT	4375	CPU Architecture
CT	4475	Concurrent Engineering and Design Testability
EET	4315	Pulse and Digital 2
EET	4317	Principles of Communication Systems 1
EET	4318	Principles of Communication Systems 2
EET	4319	Principles of Communication Systems 3
EET	4360	Photovoltaic Technology
EET	4362	Basic Power Systems 1
EET	4363	Basic Power Systems 2
EET	4364	Basic Power Systems 3
EET	4391	Basic Optics and Optical Systems Design
EET	4392	Optoelectronics and Fiber Optics
EET	4393	Applied Wave Optics
GET	4356	Engineering Economy
GET	4393	Engineering Probability and Statistics
MET	4340	Thermodynamics A
MET	4380	Materials A

*EET 4341, EET 4342, and EET 4343 Power and Control Labs 1 through 3 may be substituted for EET 4327, EET 4328, and EET 4329 Advanced Electronics Labs 1 through 3.

[†]Open Elective can be a three or four quarter-hour course.

Manufacturing Engineering Technology Programs

Manufacturing systems require interactions between machines and people. Manufacturing engineering technology is concerned with the design and use of manufacturing systems in the industrial environment.

We offer both an associate's and a bachelor's degree program in manufacturing engineering technology.

The degree programs in manufacturing engineering technology offer you the opportunity to become familiar with the machines, materials, and processes used in manufacturing. The pro-

grams emphasize the emerging use of computers without sacrificing attention to traditional areas of a manufacturing education. Areas addressed in the programs include materials and processes, computer-aided manufacturing, numerical control, and robotics. The core courses, combined with hands-on laboratory experiences, allow students to develop the skills required to work in manufacturing. Career opportunities are within various manufacturing industries, such as aircraft or electronics manufacturing.

Manufacturing Engineering Technology

(Major Code 055)

The Manufacturing Engineering Technology Program leads to the associate in engineering

degree. Degree candidates must earn 103 credits by completing the following four-year curriculum.

First-Year Courses	Fall	GET	4170	Engineering Graphics 1
		MTH	4107	College Algebra
	Winter	GET	4171	Engineering Graphics 2
		MTH	4108	Pre-Calculus
	Spring	GET	4100	Computer Programming for Engineering Technology
		MTH	4120	Calculus 1
Second-Year Courses	Fall	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Laboratory 1
	Winter	ENG	4100	Critical Writing 1
		PHY	4118	Physics 2
		PHY	4197	Physics Laboratory 2
	Spring	GET	4306	Technical Communications
		PHY	4119	Physics 3
		PHY	4198	Physics Laboratory 3
Third-Year Courses	Fall	MFG	4321	Computer-Aided Manufacturing 1
		MTH	4122	Calculus 3
	Winter	GET	4393	Engineering Probability and Statistics
		MFG	4322	Computer-Aided Manufacturing 2
	Spring	CHM	4130	Chemical Principles 1
		ENG	4111	Critical Writing 2
		MFG	4311	Manufacturing Materials and Processes 1*
Fourth-Year Courses	Fall	MFG	4312	Manufacturing Materials and Processes 2
		MFG	4331	Computer Methods in Manufacturing Design 1
	Winter	EET	4320	Electricity and Electronics
		MFG	4332	Computer Methods in Manufacturing Design 2
	Spring	ECN	4115	Economic Principles and Problems 1
		()		Social Science/Humanities Elective
		()		Technical Elective

*MET 4380 Materials A may be substituted for MFG 4311 Manufacturing Materials and Processes 1.

Manufacturing Engineering Technology
(Major Code 056)

The Manufacturing Engineering Technology Program leads to the bachelor of science in engineering technology degree. Degree candi-

dates must earn 188 credits by completing the following seven-year curriculum.

First-Year Courses	Fall	CHM	4130	Chemical Principles 1
		GET	4170	Engineering Graphics 1
		MTH	4107	College Algebra
	Winter	GET	4171	Engineering Graphics 2
		MTH	4108	Pre-Calculus
	Spring	GET	4100	Computer Programming for Engineering Technology
MTH		4120	Calculus 1	
Second-Year Courses	Fall	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	Winter	ENG	4100	Critical Writing 1.
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	Spring	GET	4306	Technical Communications
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	Fall	MFG	4321	Computer-Aided Manufacturing 1
		MTH	4122	Calculus 3
	Winter	GET	4393	Engineering Probability and Statistics
		MFG	4322	Computer-Aided Manufacturing 2
	Spring	ENG	4111	Critical Writing 2
		MFG	4311	Manufacturing Materials and Processes 1*
		()		Social Science/Humanities Elective
Fourth-Year Courses	Fall	MFG	4312	Manufacturing Materials and Processes 2
		MFG	4331	Computer Methods in Manufacturing Design 1
		()		Social Science/Humanities Elective
	Winter	EET	4320	Electricity and Electronics
		MFG	4332	Computer Methods in Manufacturing Design 2
	Spring	CHM	4130	Chemical Principles 1
		ECN	4115	Economic Principles and Problems 1
		()		Social Science/Humanities Elective

*MET 4380 Materials A may be substituted for MFG 4311 Manufacturing Materials and Processes 1.

Fifth-Year Courses

<i>Fall</i>	MET	4301	Mechanics A
	MS	4332	Statistical Quality Control
	(	)	Social Science/Humanities Elective
<i>Winter</i>	OM	4301	Introduction to Operations Management
	MET	4302	Mechanics B
	MFG	4341	Introduction to Computer-Aided Design
<i>Spring</i>	(	)	Social Science/Humanities Elective
	(	)	Social Science/Humanities Elective
	(	)	Technical Elective

Sixth-Year Courses

<i>Fall</i>	GET	4356	Engineering Economy
	(	)	Technical Elective
<i>Winter</i>	OM	4314	Productivity Enhancement and Quality
	MET	4340	Thermodynamics A
	(	)	Social Science/Humanities Elective
<i>Spring</i>	MFG	4351	Assembly Automation
	(	)	Technical Elective

Seventh-Year Courses

<i>Fall</i>	MFG	4361	Numerical Controlled Machines (Basic)
	MFG	4381	Plant Layout and Design
<i>Winter</i>	MFG	4371	Robotics
	(	)	Technical Elective
<i>Spring</i>	HRM	4301	Organizational Behavior
	(	)	Social Science/Humanities Elective
	(	)	Technical Elective

Suggested Technical Electives

CT	4345	Assembly Language
CT	4380	Data Communication Methods
CT	4395	Computer Security
CT	4475	Concurrent Engineering and Design Testability
CT	4480	Local Area Networks 1
CT	4481	Local Area Networks 2
EET	4381	Telecommunications Systems 1
EET	4382	Telecommunications Systems 2
EET	4383	Telecommunications Systems 3
EET	4384	Video Communications
EET	4391	Basic Optics and Optical Systems Design
EET	4392	Optoelectronics and Fiber Optics
EET	4393	Applied Wave Optics
MET	4303	Mechanics C
MET	4314	Stress Analysis A
MET	4315	Stress Analysis B
MET	4370	Fluid Mechanics A
MET	4371	Fluid Mechanics B
MFG	4313	Modern Manufacturing Materials and Processes
MFG	4390	Special Topics in Manufacturing Technology
MFG	4391	Independent Study in Manufacturing Technology
MFG	4392	Special Problems in Manufacturing Technology
MFG	4393	Independent Study

Mechanical Engineering Technology Programs

Mechanical engineering technologists harness power resources that help machinery perform useful tasks. In contrast to civil engineering, which deals primarily with static forces and structures, mechanical engineering is concerned with the motion and kinetics of devices that are activated by hydraulic, electrical, mechanical, and thermodynamic forces.

We offer both an associate's and a bachelor's degree program in mechanical engineering technology. A bachelor's degree program in aerospace maintenance engineering technology is also offered.

The associate's degree offers you the opportunity to prepare to be an entry-level technician in designing, producing, and installing mechanical tools, machinery, engines, and transportation equipment. The bachelor's degree focuses on designing, developing, operating, and installing equipment that involves interactions of mechanical, hydraulic, and thermodynamic systems. The equipment may include machinery, engines, boilers, furnaces, air-conditioning systems, heating systems, and transportation.

Graduates of the associate's degree program in mechanical engineering technology (MET) may find entry-level career opportunities in almost any industry or engineering organization.

The mechanical engineering technology field provides opportunities for people with a broad range of interests, motivations, and abilities. For example, as a graduate working in the materials area you might be involved in specifying materials for a particular application; determining the cause of failures in the field; dealing with corrosion problems and corrosion prevention; and working with the manufacture and production of materials, or their sales and delivery.

Manufacturing attracts many MET graduates. As a tool designer, you might design a fixture for holding parts as they are manufactured. As a manufacturing technologist, you might specify how a complicated part is made, which proce-

dures will come first, and the cost of the operation. You might determine which machines are required to make a certain part. Or, you might program computerized numerical control (CNC) machines or robots, devise efficient material-handling schemes, and plan the flow of materials from raw stock to finished product.

Another area in the field is mechanical design. At a technician level a designer needs basic graphics skills and will typically work on a computer graphics terminal. Such people generally have excellent drafting skills. Designers, whether technicians or technologists, also need to understand material properties and manufacturing processes, so that designs use materials effectively and can be manufactured efficiently.

Design analysis, another popular career focus, is the proper sizing and shaping of materials based on their function (that is, the loads they must carry, the operating environment, and other service conditions). The designer may work on airplanes, ships, engines, oil well drilling or pumping equipment, toys, medical equipment, food processing equipment—the possibilities are endless.

Another career option is plant or building management, which involves heating, ventilation, air-conditioning, water, lighting, plumbing, and electrical power requirements. Career opportunities also exist in product or system operation, testing, and technical sales.

The bachelor's degree program in aerospace engineering technology offers preparation for designing, developing, operating, installing, and producing aircraft and aircraft component systems. Career opportunities are available in technical, support, and management positions within the aircraft industry. Additional opportunities may be found within engineering teams that manufacture aircraft or spacecraft components, and among design/application positions in both the civilian and military aerospace markets.

Mechanical Engineering Technology

(Major Code 021)

The Mechanical Engineering Technology Program leads to the associate in engineering degree. The program is accredited by the Technology Accreditation Commission of the

Accreditation Board for Engineering and Technology. Degree candidates must earn 107 credits by completing the following four-year curriculum.

First-Year Courses	<i>Fall</i>	GET	4170	Engineering Graphics 1
		MTH	4107	College Algebra
	<i>Winter</i>	GET	4171	Engineering Graphics 2
		MTH	4108	Pre-Calculus
	<i>Spring</i>	GET	4100	Computer Programming for Engineering Technology
		MTH	4120	Calculus 1
Second-Year Courses	<i>Fall</i>	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	<i>Winter</i>	MTH	4122	Calculus 3
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	<i>Spring</i>	ENG	4100	Critical Writing 1
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	<i>Fall</i>	GET	4306	Technical Communications
		GET	4364	Kinematics
		MET	4301	Mechanics A
	<i>Winter</i>	CHM	4103	Chemical Principles 1
		MET	4302	Mechanics B
	<i>Spring</i>	MET	4314	Stress Analysis A
		MET	4380	Materials A
Fourth-Year Courses	<i>Fall</i>	ECN	4115	Economic Principles and Problems 1
		MET	4315	Stress Analysis B
		MET	4388	Measurement and Analysis 1
	<i>Winter</i>	ENG	4111	Critical Writing 2
		MET	4340	Thermodynamics A
		MET	4389	Measurement and Analysis 2
	<i>Spring</i>	MET	4370	Fluid Mechanics A
		MET	4391	Mechanics Laboratory*
		()		Social Science/Humanities Elective

*MET 4392 Fluid Mechanics Laboratory or MET 4393 Thermal Analysis Laboratory may be substituted for MET 4391 Mechanics Laboratory.

Mechanical Engineering Technology
(Major Code 023)

The Mechanical Engineering Technology Program leads to the bachelor of science in engineering technology degree. The program is accredited by the Technology Accreditation

Commission of the Accreditation Board for Engineering and Technology. Degree candidates must earn 189 credits by completing the following seven-year curriculum.

First-Year Courses	Fall	GET	4170	Engineering Graphics 1
		MTH	4107	College Algebra
	Winter	GET	4171	Engineering Graphics 2
		MTH	4108	Pre-Calculus
	Spring	GET	4100	Computer Programming for Engineering Technology
		MTH	4120	Calculus 1
Second-Year Courses	Fall	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	Winter	MTH	4122	Calculus 3
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	Spring	ENG	4100	Critical Writing 1
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	Fall	GET	4306	Technical Communications
		GET	4364	Kinematics
		MET	4301	Mechanics A
	Winter	CHM	4103	Chemical Principles 1
		MET	4302	Mechanics B
	Spring	MET	4314	Stress Analysis A
		MET	4380	Materials A
Fourth-Year Courses	Fall	ECN	4115	Economic Principles and Problems 1
		MET	4315	Stress Analysis B
		MET	4388	Measurement and Analysis 1
	Winter	ENG	4111	Critical Writing 2
		MET	4340	Thermodynamics A
		MET	4389	Measurement and Analysis 2
	Spring	MET	4370	Fluid Mechanics A
		MET	4391	Mechanics Laboratory
		()		Social Science/Humanities Elective

Fifth-Year Courses

<i>Fall</i>	GET	4356	Engineering Economy
	MET	4303	Mechanics C
<i>Winter</i>	MET	4341	Thermodynamics B
	MET	4371	Fluid Mechanics B
	MET	4392	Fluid Mechanics Laboratory
<i>Spring</i>	MET	4342	Refrigeration and Air-Conditioning
	MET	4481	Materials B

Sixth-Year Courses

<i>Fall</i>	MET	4343	Heat Transfer
	MET	4393	Thermal Analysis Laboratory
	()		Social Science/Humanities Elective
<i>Winter</i>	MET	4330	Mechanical Design A
	()		Social Science/Humanities Elective
<i>Spring</i>	MET	4331	Mechanical Design B
	MET	4395	Mechanical Projects Laboratory
	()		Social Science/Humanities Elective

Seventh-Year Courses

<i>Fall</i>	CMN	()	Communication Elective
	()		Social Science/Humanities Elective
	()		Technical Elective
<i>Winter</i>	CMN	()	Communication Elective
	EET	4320	Electricity and Electronics
	()		Technical Elective
<i>Spring</i>	()		Open Elective*
	()		Social Science/Humanities Elective
	()		Technical Elective

Suggested Technical Electives

CET	4301	Plane Surveying
CET	4331	Steel Design 1
CET	4371	Concrete Design 1
MET	4414	Mechanical Vibrations
MET	4416	Stress Analysis C
MET	4444	Power Generation
MET	4482	Applied Metallurgy

*Open Elective can be a three or four quarter-hour course.

Aerospace Maintenance Engineering Technology

(Major Code 098)

The Aerospace Maintenance Engineering Technology Program leads to the bachelor of science in engineering technology degree. Before entering the program, degree candidates must complete the East Coast Aero Technical School airframe and power plant technical curriculum or its equivalent. In addition, degree

candidates must complete four prerequisite courses. The prerequisite courses are MTH 4107 College Algebra; MTH 4108 Pre-Calculus; MTH 4120 Calculus 1; and CHM 4130 Chemical Principles 1. Degree candidates must earn at least 189 credits by completing the following five-year curriculum.

First-Year Courses	Fall	GET	4170	Engineering Graphics 1
		MTH	4121	Calculus 2
	Winter	GET	4171	Engineering Graphics 2
		MTH	4122	Calculus 3
	Spring	GET	4100	Computer Programming for Engineering Technology
		(	)	Social Science/Humanities Elective
Second-Year Courses	Fall	ENG	4100	Critical Writing 1
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	Winter	ENG	4111	Critical Writing 2
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	Spring	GET	4306	Technical Communications
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	Fall	ECN	4115	Economic Principles and Problems 1
		MET	4301	Mechanics A
	Winter	MET	4302	Mechanics B
		MET	4340	Thermodynamics A
	Spring	MET	4314	Stress Analysis A
		MET	4380	Materials A

Fourth-Year Courses

<i>Fall</i>	MET	4388	Measurement and Analysis 1
	(	)	Social Science/Humanities Elective
	(	)	Social Science/Humanities Elective
<i>Winter</i>	EET	4320	Electricity and Electronics
	MET	4341	Thermodynamics B
	MET	4389	Measurement and Analysis 2
<i>Spring</i>	MET	4370	Fluid Mechanics A
	(	)	Social Science/Humanities Elective

Fifth-Year Courses

<i>Fall</i>	MET	(	)	Technical Elective
	(	)		Social Science/Humanities Elective
<i>Winter</i>	MET	(	)	Technical Elective
	(	)		Open Elective*
	(	)		Social Science/Humanities Elective
<i>Spring</i>	MET	448I		Materials B
	(	)		Social Science/Humanities Elective
	(	)		Social Science/Humanities Elective

Suggested Technical Electives

Same as Mechanical Engineering Technology suggested technical electives (see page 25).

*Open Elective can be a three or four quarter-hour course.

Telecommunications Program

Telecommunications is an interdisciplinary concentration demanding skills and information from several areas of engineering technology. Modern society has experienced an unprecedented growth in information processing and communications, so that individuals who can help design and maintain information and communication systems are in high demand.

We offer an associate's degree program in telecommunications, which offers you the

opportunity to study the electronic transfer of information through voice, data, or video media. Specific methods of electronic transfer, such as electronic signals in wires, light waves in optic fibers, and radio waves in the earth's atmosphere are discussed. There are career opportunities in the telephone, data processing, radio transmission/reception, cable television, service, and computer industries.

Telecommunications (Major Code 038)

The Telecommunications Program leads to the associate in science degree. Degree candidates

must earn 101 credits by completing the following four-year curriculum.

First-Year Courses	Fall	EET	4180	Introduction to Telecommunications
		MTH	4107	College Algebra
	Winter	GET	4100	Computer Programming for Engineering Technology
		MTH	4108	Pre-Calculus
	Spring	GET	4170	Engineering Graphics 1
		MTH	4120	Calculus 1
Second-Year Courses	Fall	MTH	4121	Calculus 2
		PHY	4117	Physics 1
		PHY	4196	Physics Lab 1
	Winter	ENG	4100	Critical Writing 1
		PHY	4118	Physics 2
		PHY	4197	Physics Lab 2
	Spring	GET	4306	Technical Communications
		PHY	4119	Physics 3
		PHY	4198	Physics Lab 3
Third-Year Courses	Fall	EET	4151	Circuit Analysis 1
		EET	4384	Video Communications
	Winter	ECN	4115	Economic Principles and Problems 1
		EET	4124	Circuits Lab 1
		EET	4152	Circuit Analysis 2
	Spring	EET	4125	Circuits Lab 2
		EET	4310	Electrical Measurements
		ENG	4111	Critical Writing 2
	Fourth-Year Courses	Fall	EET	4311
EET			4381	Telecommunications Systems 1
Winter		EET	4312	Electronics 2
		EET	4382	Telecommunications Systems 2
Spring		EET	4323	Electronics Lab
		EET	4383	Telecommunications Systems 3
		MGT	4101	Introduction to Business and Management 1

Certificate Program Description

C/C++/UNIX Specialist Certificate Program (Major Code 070)

This certificate enables individuals to improve or increase their knowledge of the latest computer software developments. People wishing to improve their chances of changing or obtaining a job dealing with state-of-the-art topics in the computer field should enroll in this program.

You may be eligible to enter the certificate program if you hold a BS, a BA, or have work experience in the computer industry and knowledge of a higher level language. In addition, a

combined maximum of two courses may be waived via transfer credit or proficiency examination. If you have none of the listed requirements but are interested in learning how to become qualified to enter the program, contact the School of Engineering Technology at 617-373-2500.

A sample program showing how the certificate can be earned in one year of part-time study, taking three courses per quarter, follows.

<i>Fall</i>	CT	4150	Computer Organization
	CT	4311	Programming with the C Language
	GET	4306	Technical Communications
<i>Winter</i>	CT	4330	Data Structures
	CT	4393	UNIX Operating System
	TCC	4301	Computer Software Technical Writing 1
<i>Spring</i>	CT	4340	Software Engineering Design
	CT	4394	C++ Object-Oriented Programming
	TCC	4302	Computer Software Technical Writing 2

Minor Program Descriptions

Overview

This section lists required courses for minor degrees in computer technology, electrical engineering technology, and mechanical engineering technology. You do not have to be enrolled in a School of Engineering Technology degree program to obtain one of these minors but must meet the course prerequisites published in the course descriptions section of this bulletin.

Before you pursue a minor, consult one of our academic advisers concerning eligibility and scheduling. Advisers are available in the Engineering Technology Dean's Office, 120 Snell Engineering Center, or by phone at 617-373-2500. Minors will be indicated on your transcript after you have satisfactorily completed the minor requirements and have received your degree.

Computer Technology Minor Program

To qualify for the minor in computer technology, you must complete the following courses and laboratory.

CT	4311	Programming with the C Language
CT	4315	FORTRAN Laboratory
CT	4330	Data Structures
CT	4340	Software Engineering Design
CT	4345	Assembly Language
CT	4374	Introduction to CPU Hardware
CT	4375	CPU Architecture <i>or</i> CT 4393 UNIX Operating System
CT	4381	Operating Systems

Electrical Engineering Technology Minor Program

To qualify for the minor in electrical engineering technology, you must complete the following courses and laboratories.

EET	4124	Circuits Laboratory 1
EET	4125	Circuits Laboratory 2
EET	4151	Circuit Analysis 1
EET	4152	Circuit Analysis 2
EET	4311	Electronics 1
EET	4312	Electronics 2
EET	4323	Electronics Laboratory
EET	4330	Energy Conversion <i>or</i> EET 4377 Control Engineering 1

Mechanical Engineering Technology Minor Program

To qualify for a minor in mechanical engineering technology, you must complete the following courses.

MET	4301	Mechanics A
MET	4302	Mechanics B
MET	4314	Stress Analysis A
MET	4340	Thermodynamics A
MET	4370	Fluid Mechanics A
MET	4380	Materials A
MET	4388	Measurement and Analysis 1
MET	4389	Measurement and Analysis 2

Course Descriptions

Overview

This section contains the following information about each course offered by the School of Engineering Technology.

- Course number. Each alpha/numeric course number provides specific information. For example, consider the course number CET 4301.

CET 4301 The alpha code indicates which department is offering the course. In this case, the department is civil engineering technology.

CET 4301 The first number in the numeric code indicates whether the course is offered through the full- or part-time division. All 4000 series courses are offered part-time and most 1000 series courses are offered full-time.

CET 4301 The last three numbers in the code indicate the course level: 001–099 are compensatory courses; 100–299 are introductory- to intermediate-level courses; and 300–699 are advanced-level courses.

- Course title.
- Number of quarter hours (QH). One quarter hour represents approximately three hours of student learning time (fifty minutes of lecture plus two hours of independent study) per week. If appropriate, class hours (CH) and lab hours (lab) are listed as well.
- Quarters in which the course is offered. Not all courses are offered every quarter. If the code TBA is printed next to a course title, call the program coordinator at 617-373-2500 for scheduling information.
- Topics discussed in the course.
- Prerequisites. Complete prerequisites before enrolling, unless otherwise specified.

Use the curriculum listed for your program to determine which courses you need to complete

in the next academic year (“Program Descriptions,” see page 5). Use the course descriptions to read about each specific course and to learn the quarters in which the course is offered. Because most courses are not offered every quarter, plan your course load for the entire academic year, not just the next quarter.

Before registration, get the *University College and School of Engineering Technology Schedule* for the next quarter by calling 617-373-2500. The *Schedule* provides you with the meeting times and locations for the courses being offered during the next quarter.

Academic counseling is available to help plan your course load for the coming academic year. In addition, you can get a current *Tentative Part-Time Schedule*, which is published annually. If you need help, contact a School of Engineering Technology program counselor at 617-373-2500.

Policy on Changes of Program

The School of Engineering Technology reserves the right to cancel, modify, or add to the courses in any curriculum. The University further reserves the right to change the requirements for graduation. Any changes that may be made from time to time relative to this policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

Guidelines for Choosing Electives

Many of the degree program curricula require students to complete electives. The electives give students the opportunity either to explore topics beyond the curriculum’s scope or to gain extensive knowledge about topics introduced by the core courses.

Open Electives

Any course is acceptable as an open elective except physical education, military science, and preparatory courses. An open elective may be either a three or a four quarter-hour course depending on your major.

Social Science/Humanities Electives

Social science/humanities electives are offered through University College and must be chosen from a list that is available from the School of Engineering Technology. Some majors require that six quarter-hours of social science/humanities electives be in the communication studies (CMN) category.

Technical Electives

Technical electives must be chosen from the list of suggested technical electives appearing at the end of the respective degree curriculum. Students wishing to take an upper-level course that does not appear on the list must petition for permission before attending the class. Students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with personal career objectives—for approval by the program coordinator.

Preprofessional Medical Courses

The following information is provided for students who plan to apply for admission to schools of medicine, osteopathy, dentistry, podiatry, or optometry. Those who wish to pursue veterinary medicine may need to meet different entrance requirements and should consult the chair of the Health Professions Advisory Committee for additional advice at 617-373-2818.

Medical School Admission Requirements

Students must complete the following courses before they may enroll in medical school, and should complete them before taking the school's particular admission test (MCAT, DAT, and so on). MCAT exam applications are available from the Office of Career Development, 120 Ryder Hall, 617-373-2430.

- Biology: one year (with labs)
- General chemistry: one year (with labs)
- Organic chemistry: one year (with labs)
- Physics: one year (with labs)
- College mathematics: one year (with some calculus)
- College English: one year

Northeastern University's Health Professions Advisory Committee provides academic advice and help with professional school applications to students in any of the University's health

programs. Although advice is available to anyone enrolled in a course, the committee can prepare evaluation letters only for those who have letters of recommendation from at least two North-eastern faculty members.

Sources of Advice

General Counseling, Application Procedures and Entrance Exams

C. H. Ellis, Jr., Chair
Health Professions Advisory Committee
Department of Biology
College of Arts and Sciences
445 Richards Hall
Northeastern University
Boston, Massachusetts 02115
617-373-4032

Course Schedules and Counseling

Paula Vosburgh, Assistant Dean and
Director
Health Professions and Sciences Programs
University College
266 Ryder Hall
Northeastern University
Boston, Massachusetts 02115
617-373-2818

Physics and Mathematics Courses

School of Engineering Technology
120 Snell Engineering Center
Northeastern University
Boston, Massachusetts 02115
617-373-2500

Course Sequences to Meet Minimum Admission Requirements

Acceptable course sequences can be taken at University College to prepare students for health profession schools. Completing one sequence from each category should meet the minimum requirements of most medical or dental schools. If you have questions about whether other courses might be applicable, contact Dean Vosburgh or Professor Ellis. You should contact medical or dental school(s) directly to obtain guidance on specific courses required for admission.

General Biology: BIO 4103, BIO 4104, BIO 4105. Lab required. Other biology courses—such as anatomy, physiology, and microbiology—may be acceptable, depending on the professional school. General biology is highly recommended even if you have already taken the other courses.

Chemical Principles: CHM 4130, CHM 4131, CHM 4132. Lab required.

Organic Chemistry: CHM 4261, CHM 4262, CHM 4263. Lab required.

General Physics: PHY 4117, PHY 4118, PHY 4119, and labs PHY 4196, PHY 4197, PHY 4198.*

Mathematics: MTH 4108, MTH 4120, MTH 4121.

English: ENG 4100, ENG 4111, ENG 4112.

Requirements in two additional areas, if needed—behavioral science and biochemistry—can be met by the following courses.

Behavioral Science: PSY 4110, PSY 4111, PSY 4112, and/or other psychology courses.

Biochemistry: CHM 4371, CHM 4372, CHM 4373 or BIO 4246, BIO 4247, BIO 4248.

Chemistry

CHM 4111 General Chemistry 1

This course has been replaced by CHM 4130 Chemical Principles 1.

CHM 4130 Chemical Principles 1' (4 QH) Fall, Summer

(Formerly CHM 4111 3 QH.) Introduces fundamental chemistry concepts including symbols, formulas, equations, atomic weights, and calculations based on equations. Covers gases, liquids, solutions, and ionization. Required lab is CHM 4137 Lab for Chemical Principles 1. Lab fee. (Not open to students who have taken CHM 4111.) *Prereq.* MTH 4107 or concurrently or equiv.

Civil Engineering Technology

CET 4301 Plane Surveying (4 QH) TBA

Examines surveying principles; theory of measurements; leveling; traverse computations; area calculation; and stadia principles and topography. *Prereq.* MTH 4108.

CET 4302 Geodetic Surveying (4 QH) TBA

Introduces practical astronomy for surveying, including basic spherical trigonometry. Covers geodetic surveying, including precise leveling, triangulation, EDM equipment, and baseline measurements. *Prereq.* CET 4301.

CET 4303 Route Surveying (4 QH) TBA

Studies simple and compound curves; vertical curves; earthwork computations; solution of the mass diagram; and an introduction to route location by photogrammetry. *Prereq.* CET 4301.

CET 4307 Legal Aspects of Surveying (4 QH) TBA

Covers registry of deeds and probate; ownership of land; deeds; descriptions of qualifying expression; adverse possession; Massachusetts land court; and expert witness. *Prereq.* CET 4301.

CET 4311 Highway Engineering (4 QH) TBA

Explores engineering considerations in the planning and construction of modern highways and highway routing; traffic flow and traffic control; and computer applications to transportation problems. *Prereq.* CET 4301.

CET 4316 Land Use Planning (4 QH) TBA

Studies environmental, sociological, economic aspects, and traditional basis for land use planning. Covers objectives, content, form, and preparation of plan; community and public facilities; transportation; and environmental impact and plan implementation. *Prereq.* GET 4171.

CET 4321 Introduction to Structural Design (2 CH, 4 lab, 4 QH) TBA

Presents tabular methods for the design of members and connections using the AISC Code. *Prereq.* GET 4171 and MET 4314.

CET 4324 Structural Analysis 1 (4 QH) TBA

Surveys the reactions, shears, bending moments, and forces developed by loading systems on beams and trusses; influence lines for beams, girders, and trusses; and solutions for forces from moving load systems on statically determinate structures. *Prereq.* MET 4315.

CET 4325 Structural Analysis 2 (4 QH) TBA

Covers classical methods of deflection solution for beams and trusses. Discusses methods of solving statically indeterminate structures. *Prereq.* CET 4324.

*Some medical schools have allowed PHY 4101 and PHY 4102 College Physics 1 and 2 to be used for admission. Before choosing this sequence, contact the school you wish to apply to for their preference for a physics course sequence.

*This is a University College course offered at a different tuition rate.

CET 4331 Steel Design 1**(4 QH) TBA**

Examines design of steel members in structural frames, tension, compression, bending and eccentrically loaded members; and design of plate girders for buildings. *Prereq.* CET 4321 and MET 4315.

CET 4332 Steel Design 2**(4 QH) TBA**

Presents design of steel for highway bridges, composite design in bridges and buildings, introduction to plastic analysis, and design in steel. *Prereq.* CET 4331.

CET 4350 Environmental 1**(4 QH) TBA**

Examines principles of water supply engineering; population forecasting; and quality and quantity of water for various uses. Other topics include water treatment processes; collection and disposal of wastewater and storm water; modern treatment methods; and wastewater plant operation. *Prereq.* CET 4341 and CHM 4103 or CHM 4111.

CET 4351 Environmental 2**(4 QH) TBA**

Studies the layout and design of water treatment and sewage treatment plants; and instrumentation and electrical equipment. Includes laboratory demonstrations. *Prereq.* CET 4350.

CET 4361 Materials and Soil Mechanics**(4 QH) TBA**

Examines the physical properties of portland cement, aggregates, mixing water and admixtures; batch proportioning; bituminous materials; index properties of soils, soil moisture and structure; compressibility; and theory of consolidation. *Prereq.* MET 4315.

CET 4371 Concrete Design 1**(4 QH) TBA**

Examines the design of bending members, axially and eccentrically loaded columns by elastic and ultimate strength principles. *Prereq.* MET 4315.

CET 4372 Concrete Design 2**(4 QH) TBA**

Covers the reinforced concrete design of basic structures, including considerations of continuity. Includes an introduction to prestressed concrete member design. *Prereq.* CET 4371.

CET 4393 Construction Administration**(4 QH) TBA**

Discusses contracts, specifications, and bidding procedures; estimating and scheduling, including critical path; and discussion of personnel administration and union negotiation. Includes bid preparation for a small project. *Prereq.* None.

CET 4399 Special Problems in Civil Engineering Technology (4 QH) TBA

Engages students in theoretical or experimental work under individual faculty supervision. *Prereq.* Permission of department chair.

Computer Technology

CT 4150 Computer Organization**(4 QH) Fall**

Presents basic computer architecture. Topics include number systems' operation and conversion, logic circuits, registers, data busses, ROM/RAM, microcomputer structure and operation, microprocessor internal components, microprocessor programming, and input/output processing. *Prereq.* None.

CT 4311 Programming with the C Language**(4 QH) All Quarters**

Teaches C, a general purpose language suitable for programming operating systems, and text-processing. Covers functions, arrays, character strings, global and local variables, scope rules, pointers, address arithmetic, structures, unions, and singular linked lists. A project is required. *Prereq.* GET 4100.

CT 4315 FORTRAN Laboratory**(2 QH) TBA**

Examines elements of the FORTRAN Language with emphasis on structured programming. Topics include matrices, subroutines, functions, random number generators, and file handling. Students use the University's computer laboratory facilities to run programs. *Prereq.* CT 4311.

CT 4321 Programming with Ada**(4 QH) TBA**

Teaches Ada, a programming language for numerical applications, system programming applications, and applications with real-time and concurrent execution requirements. Includes readability, strong typing, exception handling, data abstracting, tasking, and generic units. Involves using the University's computer facilities to write programs dealing with numerical and system programming applications. *Prereq.* CT 4311, or knowledge of Pascal or FORTRAN.

CT 4330 Data Structures**(4 QH) Winter**

Introduces methods of representing and manipulating data in computer memory. Covers stacks, queues, lists, trees, heaps, sets, graphs, hashing, searching, and sorting. Project required. *Prereq.* CT 4311.

CT 4335 Numerical Methods**(4 QH) Fall**

Presents computer methods for solving mathematical problems. Involves writing and running application programs using the University's computer facilities. Covers deterministic versus stochastic methods, random number generators, iterative versus noniterative solutions, maxima and minima in two and three variables, curve fitting in two and three variables, integrals, trapezoidal and Simpson's rules, slopes, difference equations in two and three variables, vector and matrix algebra, simultaneous linear equations, nonlinear equations, permutations, and combinations. *Prereq.* CT 4311 and MTH 4122.

**CT 4340 Software Engineering Design
(4 QH) Spring**

Offers structured methods for developing complex computer software. Explores developing structured specifications, structured designs, and the computer programs for complex problems using the University's computers. Topics include partitioning, hierarchical organization, data flow diagrams, data dictionaries, structured English, decision trees, decision tables, structured charts, team design, structured programs, and maintainability. *Prereq.* CT 4330.

**CT 4345 Assembly Language
(4 QH) Fall**

Teaches typical microprocessor assembly language. Involves writing and running programs on a 68000 microprocessor-based system. Covers CPU architecture, instruction sets, addressing modes, binary operation, code conversion, subroutines, macros, and input/output. *Prereq.* CT 4150 and CT 4311.

**CT 4348 LISP
(4 QH) TBA**

Introduces an interactive language in which the LISP interpreter is commonly referred to as the read-evaluate-print loop. Discusses various levels of implementation in LISP, a language well-suited to implement the standard techniques of data structure manipulation. Also explores techniques for recursion, complex data structures, storage management, and symbol table manipulation. *Prereq.* CT 4330.

**CT 4351 Advanced Computer Organization
(4 QH) Winter**

Examines the functional characteristics of complex and special purpose computer systems, and the functions of general purpose multi-user and multi-processing operating systems. Advanced topics include virtual memory and virtual machine architectures, distributed and multiprocessor systems, array processors, and system performance analysis. *Prereq.* CT 4356 and CT 4375.

**CT 4355 Micro Peripheral Hardware
(4 QH) Winter**

Covers the elements of microprocessor peripheral hardware and its interfacing. Involves designing and analyzing microprocessor systems, including detailed schematics, timing diagrams, and technical documentation. Topics include serial input/output devices, DMA and interrupt control devices, standard busses, bus arbitration techniques, and bus support VLSI. *Prereq.* CT 4374.

**CT 4356 Complex Peripheral Hardware
(4 QH) Fall**

Studies the interfacing and implementation of complex peripheral systems. Topics include disk and tape interfaces, graphic display devices; communication interfaces and subsystems; and input/output processors. *Prereq.* CT 4355.

**CT 4360 Industry Software
(4 QH) Fall**

Surveys current commercial software packages and methods. Involves the exercise of commercial packages implemented on the University's computer facilities where applicable. Topics include specific current packages and methods drawn from the categories of: database management, scientific and statistical analysis, security and privacy, software assurance, and documentation. *Prereq.* CT 4381.

**CT 4363 Concurrent Programming
(4 QH) TBA**

Examines the basic principles of concurrent programming. Students will write and run programs to demonstrate various aspects of concurrent programming techniques and issues. Topics include correctness of concurrent programs, material exclusion, timing Dekker's algorithms, the producer-consumer problem, monitors, semaphores, "Ada Rendezvous," critical regions, and conditional variables. *Prereq.* CT 4311.

**CT 4365 Industry Hardware
(4 QH) Winter**

Discusses the latest industrial developments and trends in computer hardware, conducted as a seminar. *Prereq.* CT 4356.

**CT 4368 Semiconductor Logic
(4 QH) Fall**

Presents basic topics of digital logic and electronics. Topics include diodes, transistors, integrated-circuit logic families, logic gates, Boolean algebra, combinatorial logic, flip-flops, and counters. *Prereq.* EET 4152.

**CT 4369 Computer Logic
(4 QH) Winter**

Introduces the hardware building blocks of digital computers. Teaches students to specify configurations of gates and memory components to achieve combinational and sequential composite logical functions, and perform finite state machine design and analysis. Topics include gates, flip-flops, registers, decoders, ALUs, memory arrays, and synchronous and asynchronous state machines. *Prereq.* CT 4368.

**CT 4374 Introduction to CPU Hardware
(4 QH) Spring**

Introduces the circuits and operation of microcomputers, focusing on microprocessor components and circuits, including detailed timing and functional analysis of their interactions. Topics include central processing unit, memory, addressing, clocking, bus concepts, interrupts, coprocessors, input/output, and instruction timing. *Prereq.* CT 4345 and CT 4369.

**CT 4375 CPU Architecture
(4 QH) Fall**

Presents high performance microprocessor architecture and hardware interfacing techniques. Analyzes current commercial processors and their support components. Topics include internal CPU architecture, memory management, instruction prefetch, privilege states, bus cycles, control lines, input/output, interrupts, exceptions, and pipelining. *Prereq.* CT 4374.

**CT 4377 VLSI Design
(4 QH) TBA**

Introduces Very Large Scale Integration (VLSI) Integrated Circuits (ICs), the key components of all modern computers. Examines MOS devices, circuits, design methods, and fabrication techniques used in producing custom VLSI ICs. Topics include MOS transistor characteristics; basic gate circuits; scaling; layout tools, both manual and automated; wafer fabrication techniques; standards; testing; and costs. *Prereq.* CT 4369.

**CT 4380 Data Communication Methods
(4 QH) Spring**

Discusses the ISO Open Systems Interconnect model for communication systems, including the functional and operational aspects of data communication devices and software. Uses a black box approach. Topics include modems, control units, multiplexers, concentrators, front-end processors, and error checking. *Prereq.* CT 4374.

**CT 4381 Operating Systems
(4 QH) Spring**

Introduces the basic principles and organization of operating system implementation. Topics include processor management, process multiplexing and synchronization, schedules, atomic operations and mutual exclusion, sequential and concurrent programming, memory, and device and data management. *Prereq.* CT 4330 and CT 4345.

**CT 4382 Computer Graphics Programming
(4 QH) TBA**

Explores the computer plotting of two- and three-dimensional (2D and 3D) shapes. Involves writing and running programs using the University's computer and digital plotter. Topics include 2D transforms, 3D to 2D transforms, 3D transforms, surface representation, shading, hidden line, raster technology-color, introduction to interactive graphics, characters, curve fitting, and graphic data structures. *Prereq.* GET 4100 and GET 4170.

**CT 4383 Databases
(4 QH) TBA**

Examines database organization structure and management. Involves writing and running programs exemplifying techniques developed in class, using the University's computer facilities. Topics include access methods, attributes, indices, keys, querying, searching and matching, file sets, inverted file sets, normal forms, and random access. *Prereq.* CT 4330.

**CT 4384 Large System Assembly Languages
(4 QH) TBA**

Explores Macro, a VAX-11 assembly language, to show how basic components in the CPU are used during program execution. Topics include integer, real, and character instruction sets, various addressing techniques, procedure linkage, and system input/output. *Prereq.* CT 4345.

**CT 4387 Bit Slice Microcomputers
(4 QH) TBA**

The epitome of hardware flexibility is represented by the bit slice CPU. Students examine the basic design ground rules common to this style of hardware design. *Prereq.* CT 4355.

**CT 4389 Single-Chip Microprocessors
(4 QH) TBA**

When small 8-bit intelligent devices are rewired in high volume, the single-chip microprocessor in the form of the 3870, 8048, Z8, and others comes into play. An understanding of the hardware limitations of a single-chip system is the basis for this subject material. *Prereq.* CT 4375.

CT 4390 Special Problems in Computer Technology (4 QH) TBA

Students perform theoretical or experimental work under individual faculty supervision. *Prereq.* *Permission of department chair.*

**CT 4391 Topics in Computer Technology
(4 QH) TBA**

Focuses on advanced topics in Computer Technology to be selected by the instructor. *Prereq.* *Permission of the instructor.*

**CT 4393 UNIX Operating System
(4 QH) Winter**

Introduces UNIX operating system concepts, tools, and utilities. Helps students become proficient users. Develops a fundamental understanding and working knowledge of UNIX. Topics include system commands, file system concepts, text processing tools, electronic communication, processes, shell script programming, command procedures, pipes, I/O redirection, filters, system administration, and security. Students use the University's computer facilities to prepare course assignments. *Prereq.* CT 4311.

**CT 4394 Object-Oriented Programming
(4 QH) Spring**

Examines the methodologies currently used in object-oriented programming languages, drawing on case studies of Small Talk, Flavors, CLOS, and C++. Other topics include G-Base, an object-oriented database system, and the concepts of abstraction, polymorphism, class inheritance, locks, and generic dispatch. *Prereq.* CT 4330.

**CT 4395 Computer Security
(4 QH) TBA**

Covers issues related to security in computing, including the history of security, encryption techniques and applications, secure communications, and software protection. Other topics include software verification and validation, designing security into the hardware, and products currently available for securing systems and data. These subjects will be addressed in terms of privacy as well as reliability. *Prereq.* CT 4380 and CT 4381.

CT 4396 PROLOG: An Introduction to Artificial Intelligence (4 QH) TBA

Introduces fundamental artificial intelligence (AI) terms and techniques, using PROLOG as a programming language. Topics include knowledge representation, search, parsing, logic, and inference techniques. Projects required. *Prereq.* CT 4330.

CT 4397 Advanced UNIX Programming (4 QH) TBA

Studies the design and development of C application programs that interface with the UNIX operating system kernel. Enables C programmers to interact with the UNIX operating system through system calls and library routines. Topics include system programming tools, fundamental concepts, file creation and access, signals and signal handling, multitasking, file and terminal I/O, process creation and program execution, and forms of interprocess communication and synchronization (pipes, message queues, semaphores, and shared memory). Students use the University's computer facilities to prepare course assignments. *Prereq.* CT 4393.

CT 4470 Introduction to X Windows (4 QH) TBA

Examines the basic theory of programming in X Windows. Topics include event-loops, 2D-drawing primitives, mouse-handlers, color, call backs, Xlib environment, Xt intrinsics, and widgets. Students use the University's computer laboratory facilities to run programs. *Prereq.* CT 4330 and CT 4393 or equiv.

CT 4475 Concurrent Engineering and Design Testability (4 QH) TBA

Studies techniques used by world-class manufacturers in designing electronic systems, boards, and devices. Examines how the systems are manufactured, tested, and maintained at minimum cost and delivered to market in the minimum time. Topics include concurrent engineering principles, digital and analog circuit design guidelines, commercially available micro-processors and support circuits, industry and government standards (IEEE 1149, MIL-STD 2165), and test techniques and strategies. *Prereq.* CT 4355.

CT 4480 Local Area Networks 1 (4 QH) Fall

Introduces Local Area Network concepts, architectures, application, protocols, and components. Focuses on the first three layers of the ISO reference model: physical, data link, and network layers. Examines Ethernet, SNA, Token Bus, Token Ring, and other IEEE standards. (Not open to students who have taken CT 4379.) *Prereq.* CT 4380.

CT 4481 Local Area Networks 2 (4 QH) Winter

Examines the upper four layers of the ISO reference model: transport, session, presentation, and application layers. Topics include TCP/IP, DECNET, NETBIOS, FTP, TELNET, and E-MAIL. *Prereq.* CT 4480 or permission of the instructor.

CT 4492 Independent Study in Computer Technology (4 QH) TBA

Independent study of advanced computer technology projects for students—usually in their junior or senior year—who have high scholastic standing. Projects may be of an applied or theoretical nature resulting in a formal report submitted to the project supervisor at the end of the quarter. *Prereq.* Permission of adviser and project supervisor.

CT 4493 Independent Study in Computer Technology (4 QH) TBA

Independent study of advanced computer technology projects for students—usually in their junior or senior year—who have high scholastic standing. Projects may be of an applied or theoretical nature resulting in a formal report submitted to the project supervisor at the end of the quarter. *Prereq.* Permission of adviser and project supervisor.

Economics

ECN 4115 Economic Principles and Problems 1* (3 QH) All Quarters

Applies the basic principles of economics to current public problems. Focusing on macroeconomics, explores the issues of unemployment, inflation, national income and employment theory, and government expenditures and taxation. *Prereq.* None.

ECN 4116 Economic Principles and Problems 2* (3 QH) All Quarters

Continues ECN 4115, focuses on the role of the banking system, the Federal Reserve System, and supply-side policies. Topics in microeconomics include the role of a market pricing system, supply and demand, the costs of production, profits, and the supply decision. *Prereq.* ECN 4115 or equiv.

Electrical Engineering Technology

EET 4124 Circuits Laboratory 1 (3 lab, 2 QH) Winter

Involves experiments in DC electrical circuits and the study of various measurement techniques. Includes use of ammeters, ohmmeters, voltmeters, VOMs, and power supplies. Studies equivalent resistance, series and parallel circuits, Ohm's Law, Thevenin and Norton Theorems, as well as superposition and maximum power transfer theorems. *Prereq.* EET 4151.

*This is a University College course offered at a different tuition rate.

EET 4125 Circuits Laboratory 2**(3 lab, 2 QH) Spring**

Offers further experimentation in electrical circuits and measurement techniques. Involves the operation of oscilloscopes, audio frequency and function generators. Explores inductance, capacitance, and the effect of frequency upon them. Studies measurements of amplitude, frequency, and phase shift using a variety of series/parallel RL, RC, and RLC circuitry. Examines circuit time constants and their relation to repetition rate, along with resonance, circuit quality, and filter circuits. *Prereq.* EET 4124.

EET 4151 Circuit Analysis 1**(4 QH) Fall, Spring, Summer**

Introduces Ohm's law, Kirchhoff's current and voltage laws, equivalent resistances, independent and dependent sources, mesh and nodal analysis, and power relations, all concentrating on direct current circuits. Other topics include Thevenin and Norton theorems, the operational amplifier, and energy storage elements such as the capacitor and inductor. *Prereq.* MTH 4120 or PHY 4119.

EET 4152 Circuit Analysis 2**(4 QH) Fall, Winter, Summer**

Studies the time domain (transient) analysis of R, L, and C elements; the energy storage in L and C circuits; and the responses in source-free RL and RC circuits. Includes the application of the unit step function and the response of RLC circuits. Introduces frequency domain methods to solve sinusoidal steady-state circuits using complex frequency concepts and phasor algebra. Also covers three-phase circuits and three-wire single-phase systems. *Prereq.* EET 4151.

EET 4180 Introduction to Telecommunications**(4 QH) Fall**

Introduces students to voice, video, and data communications. Surveys the development of telephony and the operation of the telephone network. Emphasizes current developments in communications, particularly the use of digital transmission and switching. Introduces terminology peculiar to telephony. (Not open to electrical engineering technology majors.) *Prereq.* None.

EET 4310 Electrical Measurements**(4 QH) Spring**

Examines standards of measurements, dimensional analysis, errors and measurements of dispersed data, discrete and continuous variables, binomial distribution, and normal distribution. Other areas include guaranteed error, methods of resistance measurements, digital voltmeters and analog to digital conversion, voltage references, potentiometers, and AC bridges. *Prereq.* EET 4152.

EET 4311 Electronics 1**(4 QH) Fall, Summer**

Introduces elements of digital electronics, from the binary number system to Boolean algebra and DeMorgan's theorems. Discusses combinatorial logic and the basic circuitry to realize AND, OR, and NOT devices. Presents sequential logic and the bistable devices required to realize it. Explores the basic sequential circuits such as counters and shift registers. Includes analysis and design of both combinatorial and sequential circuits. *Prereq.* EET 4152.

EET 4312 Electronics 2**(4 QH) Winter, Summer**

Reviews the theory of linear circuits and extends it to simple nonlinear circuits of both two- and three-terminal varieties. Considers the solid-state theory of the PN diode as an example of the two-terminal nonlinear device, and the NPN, PNP, and field-effect devices as examples of the three-terminal nonlinear element. Includes light-sensitive and heat-sensitive solid-state devices. Considers the problem of selecting an operating point for a nonlinear device, and the corresponding practical methods of providing the required biases. Introduces the small-signal linear model for the nonlinear device in the vicinity of the operating point. *Prereq.* EET 4152 and PHY 4119.

EET 4313 Electronics 3**(4 QH) Fall, Spring**

Reviews small-signal models for three-terminal devices and discusses frequency response of such models, including the db versus log frequency plots of Henrick W. Bode. Examines operational amplifiers, including their ideal behavior and the limitations introduced by finite input and output impedances, finite gain, and finite bandwidth. Explores feedback and the stability problems that it introduces. Studies applications of feedback to oscillators and active filters design. *Prereq.* EET 4312.

EET 4314 Pulse and Digital 1**(4 QH) Fall**

Reviews the basics of Boolean algebra, combinatorial logic, and binary arithmetic. Extends these concepts to the design of coding systems such as binary, binary-coded decimal, Gray code, seven-segment displays, and multiplexers. Introduces flip-flops and sequential logic circuits such as ripple counters, synchronous counters, ring counters and Johnson counters, shift registers, solid-state memory devices, and the 555 timer. Emphasizes digital systems design using available microelectronic gates, primarily in the TTL series. *Prereq.* EET 4313.

**EET 4315 Pulse and Digital 2
(4 QH) Winter**

Examines the physical devices used to realize digital circuits, as a complement to the previous treatment of idealized mathematical models. Introduces the concepts of rise-time, fall-time, set-up time, hold-time, delay-time, and the maximum frequency of a clock. Contrasts the presently available logic families such as TTL, CMOS, and EC, and considers interconnection problems. Introduces memory elements and field-programmable logic elements. Presents interfacing devices such as analog-to-digital and digital-to-analog converters. *Prereq.* EET 4314.

**EET 4317 Principles of Communication Systems 1
(4 QH) Fall 1995**

Introduces signal analysis using Fourier methods; noise in communication systems; frequency selective amplifiers, including wideband; transistor power amplifiers AF and RF; oscillators; signal sources; and applications. *Prereq.* EET 4313.

**EET 4318 Principles of Communication Systems 2
(4 QH) Winter 1996**

Explores the basic theory of amplitude, frequency, phase, and pulse code modulated systems; analysis of modulating and demodulating circuits; carrier systems using SSB; system block and level diagrams; logic control circuits in communication systems; and modems. *Prereq.* EET 4317.

**EET 4319 Principles of Communication Systems 3
(4 QH) Spring 1996**

Presents the fundamentals of digital communications; sampling requirements; analog-to-digital conversion methods; system capacity and bandwidth; comparison of practical digital systems PAM, PCM, PFM, and PWM; time and frequency division multiplexing; data decoding; and selected examples from telemetry and computer links. *Prereq.* EET 4318.

**EET 4320 Electricity and Electronics
(4 QH) Winter**

Introduces students to circuit analysis, resistive networks, periodic excitation functions, steady state AC circuits; study of the physical foundations of electronics and the physical operation of electronic devices. (Not open to electrical engineering technology majors.) *Prereq.* MTH 4120 and PHY 4119.

**EET 4323 Electronics Laboratory
(3 lab, 2 QH) Spring**

Offers experimentation with nonlinear semiconductors. Explores junction and zener diodes. Studies typical applications in clippers, clampers, rectification, filtering, electronic power supplies, voltage regulation, and integrated circuit regulators. Discusses bipolar and field effect transistors, amplifiers and voltage follower configurations, special semiconductors and operational amplifiers. *Prereq.* EET 4311.

**EET 4327 Advanced Electronics Laboratory 1
(3 lab, 2 QH) Fall**

Includes experiments using oscilloscopes and examines transistor audio amplifiers, push-pull amplifiers, drivers, pulse and video amplifiers, transients and wave-shaping circuits, audio frequency oscillators, and operational amplifiers. *Prereq.* EET 4323.

**EET 4328 Advanced Electronics Laboratory 2
(3 lab, 2 QH) Winter**

Experiments with the modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, astable multivibrators, logic gates, flip-flops, binary adders, registers, and counters. Considers active filters, frequency modulation detectors, and analog-to-digital and digital-to-analog conversion. *Prereq.* EET 4327.

**EET 4329 Advanced Electronics Laboratory 3
(3 lab, 2 QH) Spring**

Involves spectral studies of FM and PM waves; amplitude limiters; the balanced modulators and single sideband generators; integrated circuit timers and monolithic random access memory; and monolithic phase-locked loop. Offers microwave experiments and a series of digital experiments. *Prereq.* EET 4328.

**EET 4330 Energy Conversion
(4 QH) Spring**

Explores the generalized theory of rotating energy conversion devices; steady-state operation of the multiple-excitation of direct-current machines; control of speed; special machines; transformers; steady-state considerations of induction and synchronous machines; generalized machine and circuit model; and Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. *Prereq.* EET 4353.

**EET 4337 Distributed Systems
(4 QH) Spring**

Examines radiation, transmission, and reception of electromagnetic waves; distributed-line constants and traveling waves of transmission lines; and differential equations of the uniform line. *Prereq.* MTH 4122 and PHY 4119.

**EET 4341 Power and Controls Laboratory 1
(3 lab, 2 QH) Fall 1994**

Introduces standard laboratory measurement equipment, including voltmeters, ammeters, oscilloscopes, and frequency counters, as well as data-taking methods and report writing. Investigates diodes, bipolar transistors, field effect devices, silicon control rectifiers, unijunction transistors, power supplies, regulators, and various types of feedback transistor amplifiers. *Prereq.* EET 4330.

EET 4342 Power and Controls Laboratory 2
(3 lab, 2 QH) Winter 1995

Offers experiments with characteristics of DC motors and generators, single- and multi-phase transformers, induction motors, synchronous motors, and three-phase power measurements. *Prereq.* EET 4341.

EET 4343 Power and Controls Laboratory 3
(3 lab, 2 QH) Spring 1995

Offers experiments with self-synchronous devices such as control transformers, transmitters and receivers, AC and DC servomotors, and open and closed loop response of servomechanisms and stepping motors. *Prereq.* EET 4342.

EET 4353 Circuit Analysis 3
(4 QH) Fall, Spring

Examines the application of differential equations to the solutions of linear, time-invariant electrical networks. Introduces singularity functions, convolution, and time domain transient analysis; network topology and duality; and the methods of transformation calculus and complex frequency concepts. *Prereq.* EET 4152.

EET 4354 Circuit Analysis 4
(4 QH) Winter, Summer

Covers signal analysis in the frequency domain; Fourier series; and Fourier and Laplace transform methods. Requires solving circuit problems using Laplace transforms and related theorems. *Prereq.* EET 4353.

EET 4360 Photovoltaic Technology
(4 QH) TBA

Examines the theory, operation, installation, and monitoring of a photovoltaic power system. Topics include the physics of silicon photovoltaic cells: amorphous, polycrystalline, and single crystal. Lab included. *Prereq.* EET 4311 and PHY 4119.

EET 4362 Basic Power Systems 1
(4 QH) Fall 1994

Considers power transmission lines; line constants; current, voltage, and power relations; introduction to electric-power distribution loads, feeders, and substations; and application of matrices. *Prereq.* EET 4354.

EET 4363 Basic Power Systems 2
(4 QH) Winter 1995

Studies symmetrical and unsymmetrical faults; protective devices—application and coordination; power flow in electric circuits; steady-state power limitations of systems; and voltage regulation theory and application. *Prereq.* EET 4362.

EET 4364 Basic Power Systems 3
(4 QH) Spring 1995

Examines computer applications to power systems with emphasis on load-flow studies; and basic ideas of systems planning, short-circuit studies, and system stability. *Prereq.* EET 4363.

EET 4370 Digital Computers 1
(4 QH) Fall

Introduces the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, and Boolean algebra applications to computer design. *Prereq.* EET 4314.

EET 4371 Digital Computers 2
(4 QH) Winter

Examines microprocessor architecture and organization. Studies the machine language and assembly coding of an industry-accepted microprocessor. Assigns an assembly language coding problem and analyzes a suitable topic from the current literature. *Prereq.* EET 4370.

EET 4377 Control Engineering 1
(4 QH) Winter

Analyzes linear servomechanisms under both transient and steady-state conditions. Topics include signal flow graphs and Laplace transforms used in the formulation of block diagrams, and transfer function. *Prereq.* EET 4354 and MTH 4122.

EET 4378 Control Engineering 2
(4 QH) Spring

Studies system stability, root locus techniques, treatment of Nyquist criteria, and Bode diagram methods for systems evaluation. *Prereq.* EET 4377.

EET 4381 Telecommunications Systems 1
(4 QH) Fall

Presents transmission system fundamentals, beginning with the development of the information to be transmitted in the form of voice, video, or data signals. Examines information transmission including baseband and multiplex systems. Stresses encoding analog signals into a digital format and multiplexing digital signals into the digital hierarchy. Also examines current digital transmission systems such as T-carrier, digital radio, and fiber optic systems. (Not open to electrical engineering technology majors.) *Prereq.* EET 4152 or equiv.

EET 4382 Telecommunications Systems 2
(4 QH) Winter

Introduces switching theory and practice, historical development, and circuit switching. Examines packet switching and the basics of traffic engineering. Considers time division versus space division switching, switching systems software, and digital switch architecture. (Not open to electrical engineering technology majors.) *Prereq.* EET 4381.

EET 4383 Telecommunications Systems 3**(4 QH) Spring**

Continues EET 4381 and EET 4382 by examining networks comprised of switching and transmission equipments. Considers networks of particular interest to students, including the interaction between private (PABX or key systems) networks and the public (local telephone company) network. Discusses signaling systems that communicate between portions of the network. Involves developing a transmission level plan that will tie together the subject matter. (Not open to electrical engineering technology majors.) *Prereq. EET 4382.*

EET 4384 Video Communications**(4 QH) Fall**

Examines the television signal, synchronization, balancing and interleaving, cameras, transmitters and receivers, video cassette recorders, video discs, and cable networks. (Not open to electrical engineering technology majors.) *Prereq. EET 4151 (may be taken concurrently with EET 4384), EET 4180, and PHY 4119.*

EET 4391 Basic Optics and Optical Systems**Design (4 QH) Fall**

Involves developing the basics of optical imaging in the Gaussian approximation and analyzing the various designs stemming from lens aberration, intent and forms of optical systems, and flux throughput. Presents the essentials of a wave description of light along with instrumental designs for exhibiting interference and diffraction. Assumes no previous background in optics. *Prereq. MTH 4108 and PHY 4119.*

EET 4392 Optoelectronics and Fiber Optics**(4 QH) Spring**

Presents an overview of the various elements and their characteristics utilized in optical communication systems—elements that generate light (lasers, diodes); modulate light (as in scanning or information encoding); transfer light (optical fibers); detect light; and display and store light or its encoded information. *Prereq. EET 4393 and MTH 4108.*

EET 4393 Applied Wave Optics**(4 QH) Winter**

Offers a wave optical approach to classical and modern imaging, and to interference/diffraction instrumentation and devices. Emphasizes a physically descriptive analysis of such applications as non-diffractive interference effects (interferometers, interference filters, high and anti-reflection films, and longitudinal "laser" cavity modes) and diffraction effects (apertures and gratings). Also discusses wave imagery, image processing, and the 3-D imaging of holography; polarization phenomena and associated materials and devices; and basic quantum optics. *Prereq. EET 4391, MTH 4108, and PHY 4119 or permission of instructor.*

EET 4399 Special Problems in Electrical**Engineering Technology (4 QH) TBA**

Engages students in theoretical or experimental work under individual faculty supervision. *Prereq. Permission of department chair.*

English

ENG 4100 Critical Writing 1***(4 QH) All Quarters**

(Formerly ENG 4110 3 QH.) Offers a detailed examination of the principles and methods of rhetoric, especially narration, description, and exposition. Includes frequent practice in writing paragraphs and themes in those modes. (Not open to students who have taken ENG 4110.) *Prereq. A writing proficiency test is given at the first class meeting.*

ENG 4110 Critical Writing 1 (3 QH)

This course has been replaced by ENG 4100 Critical Writing 1.

ENG 4111 Critical Writing 2***(3 QH) All Quarters**

Further examines the principles and methods of rhetoric, especially persuasion and argument, the study of short fiction, and the development of research skills. Coursework includes practice in writing persuasive and critical themes and in preparing research papers. *Prereq. ENG 4100 or equiv.*

General Engineering Technology

GET 4100 Computer Programming for**Engineering Technology (4 QH) All Quarters**

Introduces computers for problem solving using C++ Language. Topics include data types, arithmetic and logical expressions, programming loops, decision making, functions, arrays, and character string manipulation. Offers the use of the University's computer facility to run programs. *Prereq. MTH 4107 or concurrently.*

GET 4105 Computer Applications for Technology**(4 QH) TBA**

Allows students to learn the basics of computing in a microprocessor environment (DOS, Windows, Macintosh, word processing, databases, spreadsheet). Emphasizes applications relevant to technology students. Provides a foundation upon which to develop more extensive computer expertise. The skills acquired are directly transferable to subsequent courses, cooperative education assignments, and personal and professional endeavors. *Prereq. None.*

*This is a University College course offered at a different tuition rate.

GET 4170 Engineering Graphics 1**(4 QH) All Quarters**

Introduces the engineering design process. Explores freehand, instrument, and computer design and drawing techniques. Topics include engineering history, descriptive geometry, orthographic projection, cut sections, developments, and pictorial drawing techniques. *Prereq.* None.

GET 4171 Engineering Graphics 2**(4 QH) Fall, Winter, Spring**

Introduces fundamentals of engineering design and analysis through architectural, mechanical, and electrical graphics. Explores graphic representation through manual and computer-aided design techniques. Topics include manufacturing and building processes, conceptual and detail design, problem solving, and patents. Requires a design project. *Prereq.* GET 4170.

GET 4306 Technical Communications**(3 QH) Fall, Winter, Spring**

Offers an opportunity to learn the style and content guidelines for technical writing, refines technical writing skills, and develops the ability to prepare and deliver oral presentations of a professional calibre. *Prereq.* ENG 4100 or ENG 4110.

GET 4356 Engineering Economy**(4 QH) Fall**

(Formerly IIS 4360.) Presents fundamental accounting concepts and terminology, including assets, liability, net worth, and the analysis of income statements and balance sheets. Discusses introductory steps in the analysis of investment proposals, time value of money, and cash flows. Analyzes cash flows in terms of present worth, annual worth, rate of return, and benefit/cost ratio. Considers depreciation and tax effects on cash flows. (Not open to students who have taken IIS 4360.) *Prereq.* MTH 4107.

GET 4364 Kinematics**(4 QH) Fall**

Presents the principles of kinematics through manual and computer methods to analyze and design mechanisms. Topics include four bar linkage, slider cranks, cams and followers, and gears and gear trains (reverted and epicyclic). *Prereq.* GET 4171 and PHY 4117.

GET 4393 Engineering Probability and Statistics (4 QH) Winter

(Formerly IIS 4393.) Studies the algebra of events and sets, and the laws of probability. Examines the properties of discrete and continuous random variables, including density function, expected value, variance, conditional probability, independent event, and Bayes' theorem. Presents common distributions: normal, uniform, and binomial. Also covers estimation of parameters of random variables, point estimation, confidence intervals, sampling statistics, central limit theorem, and associated sampling distributions. (Not open to students who have taken IIS 4393.) *Prereq.* MTH 4122.

Human Resources Management

HRM 4301 Organizational Behavior***(3 QH) Fall**

Examines the fundamentals of organizational life, emphasizing the structure and discipline of groups typically found in a business setting. Topics include issues and data related to leadership styles, employee motivation, and organizational dynamics. Significant student participation is required. *Prereq.* None.

Industrial Engineering Technology

IIS 4360 Engineering Economy

This course's number has been changed to GET 4356.

IIS 4393 Engineering Probability and Statistics

This course's number has been changed to GET 4393.

Industrial Management

IM 4301 Introduction to Operations Management

This course's number has been changed to OM 4301.

IM 4314 Productivity Enhancement and Quality

This course's number has been changed to OM 4314.

Management

MGT 4101 Introduction to Business and Management 1* (3 QH) All Quarters

Studies the setting and general structure of American business, including objectives and practices affecting standard of living. Examines characteristics of private enterprise and the nature and challenge of capitalism and other forms of economic enterprise. Introduces business types, organization structure, and management functions. Examines what a managerial career involves including problem solving and decision making. *Prereq.* None.

*This is a University College course offered at a different tuition rate.

Management Science

MS 4332 Statistical Quality Control* (3 QH) Fall

Introduces statistical process control (SPC) and acceptance sampling used in quality control and quality assurance of products or services. Includes control charts for attributes and variables data, process capability analysis, statistical tolerancing, and acceptance sampling concepts and sampling plans for attributes. *Prereq.* ECN 4251 or equiv.

Manufacturing Engineering Technology

MFG 4311 Manufacturing Materials and Processes 1 (4 QH) Spring

Examines the structures of polymers (thermoplastics, thermosetting, glass, and rubber); manufacturing processes for polymers; thermoforming; structures of metals; and the manufacturing processes for metal forming. Also covers alloys, nonferrous metals, and various manufacturing methods and processes. *Prereq.* CHM 4103 or CHM 4111, and PHY 4117.

MFG 4312 Manufacturing Materials and Processes 2 (4 QH) Fall

Continues MFG 4311. *Prereq.* MFG 4311 or MET 4380.

MFG 4313 Modern Manufacturing Materials and Processes (4 QH) TBA

Covers advanced manufacturing processes and advanced manufacturing materials being utilized in industry. Topics include advanced forming techniques of materials, advanced coating methods of materials, advanced deburring techniques, advanced metal removal techniques, and advanced materials such as composites and ceramics. *Prereq.* MFG 4312.

MFG 4321 Computer-Aided Manufacturing 1 (4 QH) Fall

Gives an overview of computer-aided manufacturing (CAM), including group technology; material requirements planning; part coding and classification; numerical control; part programming; and management systems. Covers each area to instill an appreciation of the coming reality of the automated factory. *Prereq.* None.

MFG 4322 Computer-Aided Manufacturing 2 (4 QH) Winter

Continues MFG 4321. *Prereq.* MFG 4321.

MFG 4331 Computer Methods in Manufacturing Design 1 (4 QH) Fall

Investigates the use of computers in selected areas of manufacturing systems design. Topics include numerical control, MRP II, computer-aided process planning and control, and other important applications of computers to manufacturing. *Prereq.* MFG 4311 and MFG 4322.

MFG 4332 Computer Methods in Manufacturing Design 2 (4 QH) Winter

Continues MFG 4331; *Prereq.* MFG 4331.

MFG 4341 Introduction to Computer-Aided Design (4 QH) Winter

Introduces computational and numerical geometry for design, and studies the implementation of computer graphics in design and use of computer-aided design packages, as well as principles of numerical control techniques in design and manufacture. Involves a design project. *Prereq.* GET 4100 or FORTRAN.

MFG 4351 Assembly Automation (4 QH) Spring

Examines the field of automatic assembly; topics include automatic vibratory feeders, nonvibratory feeders, and the automatic orientation of parts to be fed. Also covers the economics of automatic assembly. Involves designing an automated assembly system if time permits. *Prereq.* MFG 4322 and MFG 4332.

MFG 4361 Numerical Controlled Machines (Basic) (4 QH) Fall

Begins with a week-long review of numerical controlled machines from material covered in MFG 4321 and MFG 4322. Provides an introduction to DNC and CNC systems followed by the study of numerical controlled machines and programming in the APT programming language. *Prereq.* MFG 4322, MFG 4332, and MFG 4341.

MFG 4371 Robotics (4 QH) Winter

Discusses the concept, classification, and structure of robots and their application in manufacturing. Topics include drive and control systems; kinetics, coordinate transformations, and trajectory interpolators; and the application, programming, and integration of robots into the manufacturing environment. *Prereq.* MFG 4361.

MFG 4381 Plant Layout and Design (4 QH) Fall

Examines the use of descriptive and optimizing models—for example, simulation, queuing theory, and linear programming—to design facilities and associated material handling systems. Applies computer-assisted layout analysis techniques to practical problems. *Prereq.* OM 4301 or IM 4301 and GET 4356 or IIS 4360.

*This is a University College course offered at a different tuition rate.

MFG 4385 TQM: ISO-9000 and Quality Management (4 QH) TBA

Introduces and focuses on the ISO-9000 Series Standards and the importance the standards play in helping to establish a basic management philosophy for quality assurance. Reviews the ISO-9000 Series in depth, with emphasis on implementation, meeting compliance requirements, achieving certification, and maintaining certification. Discusses the International Standards Organization, examines the emergence of quality as a strategic business consideration, compares quality awards and quality standards, and discusses what lies ahead for ISO-9000 and quality management. *Prereq.* OM 4314 or permission of faculty adviser.

MFG 4390 Special Topics in Manufacturing Technology (4 QH) TBA

Focuses on special or advanced topic areas that are of particular interest in the manufacturing area. *Prereq.* Permission of the instructor or student faculty adviser.

MFG 4391 Independent Study in Manufacturing Technology (4 QH) TBA

Offers theoretical and experimental work under individual faculty supervision. *Prereq.* Student must obtain a course faculty adviser.

MFG 4392 Special Problems in Manufacturing Technology (4 QH) TBA

Selected advanced problems in manufacturing technology chosen by the instructor. *Prereq.* Permission of the instructor and student adviser.

MFG 4393 Independent Study (4 QH) TBA

Selected advanced problems in manufacturing technology chosen by the instructor. *Prereq.* Permission of the instructor and student adviser.

MTH 4107 College Algebra (4 QH) All Quarters

Examines laws of exponents, factoring, operations with fractional expressions, radical and complex numbers, Pythagorean theorem and distance formula, linear and quadratic equations and inequalities, and functional notation. Includes graphing of a wide variety of functions and equations including lines, conic sections, and polynomials. Studies solutions to many types of equations including linear, quadratic, and polynomial. Also explores many applications of algebra. Students are required to purchase a TI-85 graphing calculator or equiv. *Prereq.* MTH 4006 or equiv. in high school algebra.

MTH 4108 Pre-Calculus (4 QH) All Quarters

Studies exponential and logarithmic functions, trigonometric functions of angles in degrees and radians, trigonometric identities and equations, right triangles, law of sines and cosines, inverse trigonometric functions, and polar coordinates. Examines complex numbers in trigonometric form, systems of linear and nonlinear equations, binomial theorem, arithmetic, and geometric sequences and series. Students are required to purchase a TI-85 graphing calculator or equiv. *Prereq.* MTH 4107.

MTH 4120 Calculus 1 (4 QH) All Quarters

Studies general function operations, theory and evaluation of limits, derivatives of algebraic and trigonometric functions, general rules of differentiation, Rolle's theorem, and Mean Value theorem. Also covers application of differentiation including velocity; and acceleration, related rates, maximum, minimum, curve sketching, and approximations by differentials. Examines antiderivative as an introduction to integration. Students are required to purchase a TI-85 graphing calculator or equiv. *Prereq.* MTH 4108.

MTH 4121 Calculus 2 (4 QH) All Quarters

Examines the Riemann sum and the development of the fundamental theorem with applications to areas, volumes, and rectilinear motion problems. Topics include logarithmic exponential and inverse trigonometric functions and their applications; techniques of integration including parts, partial fractions, substitution, and the use of tables; numerical integration (Simpson's and Trapezoidal rules); L'Hopital's rule; improper integrals; and geometry of vectors in a plane and space. Students are required to purchase a TI-85 graphing calculator or equiv. *Prereq.* MTH 4120.

Mathematics

MTH 4006 Technical Mathematics (4 QH) All Quarters

Reviews high school algebra equations, formulas, exponents, polynomials, factoring, scientific notation, fractions, radicals, quadratic equations, and linear equations and their applications. Students are required to purchase a TI-85 graphing calculator or equiv. (Credit cannot be used in the associate in engineering, associate in science, or the bachelor of science in engineering technology degree programs.) *Prereq.* None.

MTH 4122 Calculus 3**(4 QH) All Quarters**

Studies sequences and series to the development of Taylor and Maclaurin series, three-dimensional space, and a treatment of functions of several variables; multiple integrals with applications in areas and volumes; and differential equations, including the solution with applications of first-order with variables separable, first-order linear, and second-order linear homogeneous to complete the sequence. Students are required to purchase a TI-85 graphing calculator or equiv. *Prereq.* MTH 4121.

MTH 4123 Differential Equations**(4 QH) Fall, Winter, Spring**

Examines linear differential equations with constant coefficients, homogeneous and nonhomogeneous. Explores the variation of parameters and undetermined coefficients and simultaneous differential equations, the Laplace transform, series solution of differential equations, and the Fourier series. Studies orthogonal functions and numerical solutions of differential equations. Students are required to purchase a TI-85 graphing calculator or equiv. *Prereq.* MTH 4122.

Mechanical Engineering Technology

MET 4301 Mechanics A**(4 QH) Fall**

Studies the forces, moments, couples, and statics of particles and rigid bodies in two and three dimensions. Examines external and internal distributed forces, first moments and centroids, as well as structure-trusses, frames, and machines. *Prereq.* MTH 4120 and PHY 4117.

MET 4302 Mechanics B**(4 QH) Winter**

Explores friction and moments of inertia; the kinematics of particles; force, mass, and acceleration; work and energy. *Prereq.* MET 4301.

MET 4303 Mechanics C**(4 QH) Fall**

Studies the impulse and momentum of particles; the kinematics of rigid bodies, force, mass, and acceleration; and the dynamics of rigid bodies. Also covers introduction to mechanical vibration. *Prereq.* MET 4302.

MET 4314 Stress Analysis A**(4 QH) Winter, Spring**

Examines axially loaded members, stress and strain, allowable stresses, factor of safety, temperature effects, and indeterminate members. Other topics include shear and moment diagrams; flexural and transverse shearing stresses in beams; torsional stresses and deformations; and power transmission. *Prereq.* MET 4301.

MET 4315 Stress Analysis B**(4 QH) Fall, Spring**

Presents determinate and indeterminate beam deflections and reactions by various methods, including integration and moment-area and superposition methods. Topics include thin-walled pressure vessels and centric loading of bolted and welded connections; eccentric loads on beams and riveted and welded joints; combined stresses; principal stresses; Mohr's circle; theories of failure; and column design. *Prereq.* MET 4314.

MET 4319 Mechanics**(4 QH) Spring**

Provides an introduction to mechanics for non-mechanical majors. Studies the static analysis of forces acting on particles and rigid bodies in 2- and 3-dimensions. Also discusses centroids and centers of gravity and moments of inertia. Considers the kinematics and kinetics of particles and rigid bodies. *Prereq.* MTH 4120 and PHY 4117.

MET 4330 Mechanical Design A**(4 QH) Winter**

Introduces the principles of mechanical design, the design process, design factors, creativity, optimization, human factors, and value engineering through simple design projects. Examines principles of design, properties, and selection of materials; stress concentrations; strength under combined stresses; theories of failure; impact; and fluctuating and repeated loads. *Prereq.* MET 4314 and MET 4380.

MET 4331 Mechanical Design B**(4 QH) Spring**

Continues MET 4330 and further develops the methodology of design as applied to products, processes, and equipment. Also studies the deformation and design of fasteners, screws, joints, springs, and bearings, lubrication, and journal bearings. Covers stresses and power transmission of spur, bevel, and worm gear; shaft design, and clutches and brakes. *Prereq.* MET 4330.

MET 4340 Thermodynamics A**(4 QH) Winter**

Introduces the general theory of heat and matter; first law of thermodynamics for open and closed systems (law will be applied to nozzles, turbines, compressors, and heat exchangers); energy-transformation principles and availability of energy; and properties and processes for pure substances, liquids, and ideal gases. Also covers thermodynamic properties using tables and charts; mixtures of fluids; and vapor cycles. *Prereq.* CHM 4103 or CHM 4111 and PHY 4118.

MET 4341 Thermodynamics B**(4 QH) Winter**

Discusses the second law of thermodynamics for open and closed systems; internal combustion engines; design and performance of steam and gas turbines; gas power cycles; vapor and combined power cycles; cogeneration cycles; and refrigeration cycles. *Prereq.* MET 4340.

MET 4342 Refrigeration and Air-Conditioning (4 QH) Spring

Introduces air-conditioning principles, including psychometrics and heat pumps. Topics include calculation of heating and cooling loads in accordance with ASHRAE practices; principles of gas compression; analysis of vapor compression; refrigeration systems; low-temperature refrigeration cycles; and absorption refrigeration systems. *Prereq.* MET 4341.

MET 4343 Heat Transfer (4 QH) Fall

Presents the basic principles of heat transfer: thermal conductivity and thermal conductance/resistance. Examines heat transfer mechanisms, the basic equations of conduction, and natural and forced convection. Other topics include the radiation between simple bodies, heat transfer coefficients, heat exchanger effectiveness, and regenerative and evaporative heat exchangers. *Prereq.* MET 4341.

MET 4370 Fluid Mechanics A (4 QH) Spring

Examines hydrostatics; principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels, and hoop tension. Discusses fluid flow in pipes under pressure; fluid energy, power, and friction loss; Bernoulli's Theorem; and flow measurement. *Prereq.* MET 4302.

MET 4371 Fluid Mechanics B (4 QH) Winter

Considers pipe networks and reservoir systems, flow in open channels, and uniform flow. Also covers energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow, nonuniform flow, accelerated and retarded flow, and hydraulic jump and waves. *Prereq.* MET 4370.

MET 4380 Materials A (4 QH) Spring

Identifies methods of selection of materials for engineering applications. Topics include fundamental metallic, ceramic, and polymer structures; general information covering theoretical aspects of properties; testing and failure of materials; alloying and hardening of metals; refinement of metals; equilibrium diagrams; characteristics of engineering metals; and introduction to principles of metal fabrication. *Prereq.* None.

MET 4388 Measurement and Analysis 1 (2 CH, 1 lab, 3 QH) Fall

Discusses theory and experiments requiring collection and analysis of data by graphical and numerical methods. Examines computer applications and report writing to conclude accuracy, precision, true values, and measured values as they relate to basic mechanical measuring instruments. (Not open to students who have taken MET 4390.) *Prereq.* GET 4100, MET 4314, MTH 4122, and PHY 4119.

MET 4389 Measurement and Analysis 2 (2 CH, 1 lab, 3 QH) Winter

Continues MET 4388 with additional classes and laboratory experiments in the fundamentals of mechanical engineering measurements. (Not open to students who have taken MET 4390.) *Prereq.* MET 4388.

MET 4390 Measurement and Analysis Laboratory (3 lab, 2 QH)

This course has been replaced by MET 4388 Measurement and Analysis 1 and MET 4389 Measurement and Analysis 2.

MET 4391 Mechanics Laboratory (3 lab, 2 QH) Spring

(Formerly Technology Laboratory A.) Conducts experiments to determine mechanical properties of materials under normal and abnormal environmental conditions. Experiments include tension, bending, torsion, creep, and fatigue. *Prereq.* MET 4315, MET 4380, and MET 4389 or MET 4390.

MET 4392 Fluid Mechanics Laboratory (3 lab, 2 QH) Winter

(Formerly Technology Laboratory B.) Conducts experiments to determine the physical properties of incompressible fluids, measure flow rates and velocities utilizing pitot tubes, orifice plates, venturi meter, and weirs flow meters, U-tube differential manometers, and piezometers. *Prereq.* MET 4370 (may be taken concurrently) and MET 4389 or MET 4390.

MET 4393 Thermal Analysis Laboratory (3 lab, 2 QH) Fall

(Formerly Technology Laboratory C.) Explores basic thermodynamic relationships. Conducts experiments to examine the flow of steam and to examine the energy conversion of a fuel into a working substance. Examines related heat transfer mechanisms along with operating characteristics of thermal generators, engines, and compressors. Evaluates internal combustion engines and their characteristics. *Prereq.* MET 4341 and MET 4389 or MET 4390.

MET 4395 Mechanical Projects Laboratory (3 lab, 2 QH) Spring

(Formerly Technology Laboratory E.) Offers advanced and specialized experiments in mechanical engineering topics. Includes group term project. *Prereq.* MET 4342, MET 4343, and MET 4389 or MET 4390.

MET 4414 Mechanical Vibrations (4 QH) TBA

Studies the elements of vibrating systems, one degree of freedom, natural frequencies, and damped free and forced vibration. Presents design of vibration absorbers for industrial equipment. Requires a design project and lab experiments. *Prereq.* MET 4303.

MET 4416 Stress Analysis C**(4 QH) TBA**

Discusses curved beams, nonsymmetrical bending of beams, shear center and shear stresses on thin sections, and composite beams. Also covers columns, energy absorption and resilience, inertial stresses, impact loading, deflection of beams by energy methods, and bolted fastenings. *Prereq.* MET 4315.

MET 4444 Power Generation**(4 QH) TBA**

Explores electrical power generation by thermo-mechanical, electromechanical, nuclear, and hydraulic systems. Emphasizes the analysis of thermodynamic cycles as well as the practical deviations from the related ideal processes. Considers accessory and auxiliary equipment used in such systems. Studies design, performance, economic factors, and public issues affecting electric power generation. *Prereq.* MET 4341.

MET 4481 Materials B**(4 QH) Spring**

Discusses polymer, composite, and ceramic materials; electrical and magnetic properties; and applications for the fabrication and use of both metals and non-metals. Examines structures of metals, imperfections, and properties of nonferrous metals. Discusses fabrication methods including powder metallurgy, metal-working, casting, molding, machining, welding, and manufacturing methods. Offers experiments in preparation of samples and microstructure/analysis, and additional lab work in the construction of cooling curves and binary phase diagrams. *Prereq.* MET 4380.

MET 4482 Applied Metallurgy**(4 QH) TBA**

Examines mechanical properties of ferrous metals, the iron carbon diagram, high-temperature alloys, hardening methods, impact tests, and the effects of environment. Also discusses manufacturing processes and methods of fabrication. Offers experiments in heat treatment and surface corrosion, as well as ferrous and nonferrous metals. *Prereq.* MET 4481.

Operations Management

(Formerly Industrial Management: IM.)

OM 4301 Introduction to Operations**Management* (3 QH) TBA**

(Formerly IM 4301.) Presents concepts and principles related to operations from a managerial point of view. Examines relationships to other business functions. Explores operations as a transformation process, with inputs of materials, investment, and people producing finished goods and services. Topics include product and process design, forecasting demand, capacity planning, facilities design, aggregate planning, scheduling, and quality control and assurance. (Not open to students who have taken IM 4301 or IM 4401.) *Prereq.* MS 4325.

OM 4314 Productivity Enhancement and Quality***(3 QH) TBA**

(Formerly IM 4314.) Explores the fields of quality control and productivity from managerial, technological, behavioral, and economic perspectives. Examines the practical improvement of operations. Introduces current productivity improvement programs including measurement and control. Reviews management practices of modern quality control and explores new approaches. Includes the economics of total quality, internal and external quality, and long-term quality and reliability management. (Not open to students who have taken IM 4314.) *Prereq.* None.

Physics

PHY 4101 College Physics 1**(4 QH) Fall, Summer**

Introduces students to mechanics, including units of measurement, vectors, accelerated motion, and Newton's laws of motion. Topics include conservation of energy, work, momentum, elements of heat, mechanical waves, and vibrating bodies. Includes laboratory experiments and classroom demonstrations as an integral part of the course. (This course is intended for health professions and science programs and cannot be used for credit towards technology degrees in the School of Engineering Technology.) *Prereq.* MTH 4107 or equiv.

PHY 4102 College Physics 2**(4 QH) Winter, Summer**

Introduces magnetism, magnetic fields, electromagnetic induction, electrostatics and electric circuits. Discusses appropriate topics in optics, nuclear and atomic physics. Involves frequent laboratory experiments and classroom demonstrations. (This course is intended for the health professions and science programs and cannot be used for credit towards technology degrees in the School of Engineering Technology.) *Prereq.* PHY 4101.

PHY 4117 Physics 1**(4 QH) All Quarters**

Introduces vectors and balanced forces, accelerated motion, projectile motion, Newton's laws, work and energy, momentum, and equilibrium of rigid bodies. *Prereq.* MTH 4107 or concurrently.

PHY 4118 Physics 2**(4 QH) All Quarters**

Explores rotational motion, periodic motion, electric forces and fields, electric potential, capacitance, electromotive force, and direct current circuits. *Prereq.* PHY 4117.

*This is a University College course offered at a different tuition rate.

PHY 4119 Physics 3
(4 QH) All Quarters

Covers magnetic fields and forces, electromagnetic induction, inductance, Gauss's law, electromagnetic waves, mechanical waves, sound, and the interference and diffraction of light. *Prereq. PHY 4118.*

PHY 4196 Physics Laboratory 1
(1 QH) All Quarters

Includes experiments in acceleration, force, energy, and momentum that follow lecture topics in PHY 4117. *Prereq. PHY 4117 concurrently.*

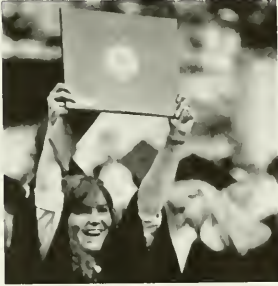
PHY 4197 Physics Laboratory 2
(1 QH) All Quarters

Includes experiments in statics, rotation, and oscillation that follow the lecture topics in PHY 4118. *Prereq. PHY 4196 and PHY 4118 concurrently.*

PHY 4198 Physics Laboratory 3
(1 QH) All Quarters

Includes experiments in circuits, electromagnetism, and waves that follow the lecture topics in PHY 4118 and PHY 4119. *Prereq. PHY 4197, PHY 4118, and PHY 4119 concurrently.*

Northeastern University



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A Profile of Northeastern

At Northeastern University, we value part-time evening and weekend students as highly as we do our full-time students. You are important members of the academic community and reflect the changing profile of today's college student, which encompasses new concerns for lifelong learning and professional retraining. Northeastern supports your pursuit of personal and professional goals and wants to contribute to your success. In return, you contribute to the intellectual and cultural diversity upon which this urban institution thrives. You take full advantage of the academic resources and facilities we offer and join all our students who are recognized and supported by the University's faculty and administration.

Founded in 1898, Northeastern University is incorporated as a privately endowed, nonsectarian institution. From its beginning, the University's mission is to identify and address the educational needs of a diverse community and student body in distinctive and useful ways. Northeastern did not duplicate the programs of other academic institutions, but instead became a world leader in new areas of educational service. Today, the University is comprised of seven undergraduate colleges and nine graduate schools. Our undergraduate colleges are:

- Bouvé College of Pharmacy and Health Sciences
- College of Arts and Sciences and School of Journalism
- College of Business Administration
- College of Computer Science
- College of Criminal Justice
- College of Engineering, including the School of Engineering Technology
- College of Nursing

Our graduate schools are:

- Graduate School of Arts and Sciences and School of Journalism
- Bouvé College of Pharmacy and Health Sciences Graduate School
- Graduate School of Business Administration
- Graduate School of Computer Science
- Graduate School of Criminal Justice
- Graduate School of Engineering
- Graduate School of Nursing

- Graduate School of Professional Accounting
- School of Law

At Northeastern, we respond to the needs of people who already hold jobs or are launched in careers but who wish to advance or change their professional lives. There are also classes for people pursuing personal interests. The University offers a variety of educational options—both credit and noncredit—to suit your particular objectives. The School of Engineering Technology offers part-time evening and weekend associate's and bachelor's degree programs in technological areas, in addition to daytime undergraduate programs. University College, so named because it draws upon the resources of Northeastern's other colleges, offers part-time day and evening programs leading to certificates and to associate's and bachelor's degrees.

All formal courses of study leading to degrees through part-time programs are approved by the full-time day faculty of Northeastern's Basic Colleges and are governed by the same qualitative and quantitative standards.

Where You'll Find Northeastern

The main campus of Northeastern University is a vibrant and progressive urban community. To all Northeastern students, the physical setting of the Boston campus extends opportunities to participate in the dynamic, exciting environment that we share with city residents. Built around a quadrangle, the campus is divided by Huntington Avenue, a major artery. It is located in the midst of such cultural landmarks as Symphony Hall, the Museum of Fine Arts, the Isabella Stewart Gardner Museum, Horticultural Hall, and the Boston Public Library. You can walk to Frederick Law Olmsted's Fenway Park, Copley Place, the Back Bay shopping district, and a number of internationally renowned hospitals. In 1910, the University began construction on the first piece of land acquired at its present site; it is now more than fifty-five acres.

The Boston campus is ideally situated for easy commuting. The MBTA Orange and Green lines provide rail service to the heart of the campus. Use either the Orange Line's Ruggles Street station or the Green Line's Northeastern University stop along the Arborway Branch to arrive on campus. The MBTA also has numerous bus routes that run along Huntington and Massachusetts avenues, which are the two major city streets closest to the campus. Finally, if you drive to Northeastern, student parking is available at reasonable rates in University-owned parking lots.

To reach increasing numbers of students and to make participation in our programs as convenient as possible, Northeastern University has established a number of suburban campuses and branch locations, as well as several off-campus athletic facilities. The campuses and branch locations house administrative and classroom facilities for Northeastern's graduate, part-time day and evening, and continuing education programs. The University also maintains many affiliations to ensure access to facilities and specialized equipment available at other institutions and organizations.

One of Northeastern's most recent acquisitions is the twenty-acre Dedham campus, just north of Route 128. This facility houses the Center for Continuing Education and space for the College of Business Administration's High Technology MBA Program.

Near the junction of Routes 128 and 3 in Burlington is the Suburban Campus of Northeastern University. Part-time undergraduate courses in a variety of subject areas and part-time graduate courses in engineering and business administration are offered. The Burlington campus also offers special programs for part-time, evening, and noncredit continuing education courses.

Situated on 165 acres of wooded, lakeside land in Ashland, the Warren Conference Center offers meeting space for groups of up to 150 people. Overnight group retreats and special events can be held at the center. Recreational activities available to conferencing groups include tennis, swimming, volleyball, and soccer.

Twenty miles northeast of Boston, the Marine Science and Maritime Studies Center is located in Nahant, on Massachusetts Bay. It serves as a site for national, international, and University research.

Henderson House is located twelve miles from Boston in suburban Weston. This facility hosts a variety of activities, including residential

seminars, workshops, short courses, and weekend meetings.

Network Northeastern

Network Northeastern uses the microwave-based Instructional Television Fixed Service (ITFS) system to broadcast courses to subscriber companies and to the Burlington and Dedham campuses. The network telecasts live classroom instruction to remote sites where students interact with instructors via a telephone-based talkback system. A courier service collects and delivers course materials and serves as the off-campus student's link to academic and administrative departments.

Network Northeastern currently broadcasts educational programs to over thirty local corporations. Courses are offered in graduate engineering, graduate computer science, undergraduate engineering technology, and state-of-the-art programs for professional development. Network Northeastern also delivers graduate level and short courses to corporations throughout the United States via satellite.

University Libraries

Together, the collections, services, staff, and facilities of the Northeastern University Libraries provide access to information and an understanding of the organization of the literature and other information resources of the academic disciplines. The library is integral to the academic and research processes, whether these occur in a formal classroom, seminar, or laboratory setting or through individual study and enrichment.

All students, whether full-time or part-time, have full access to all units of the University Libraries located on the Boston and Burlington campuses and at the Marine Science Center in Nahant.

Snell Library, a centralized library for the Boston campus, is open more than 100 hours each week that classes are in session. It has 2,800 seats on five levels and shelving for more than 1.25 million volumes. Library services incorporate online, telecommunication, and media technologies that are associated with

information resources, including an online catalog and circulation system, microcomputer and language laboratories, and a CD-ROM optical disc network.

Total holdings of the University Libraries include more than 770,000 volumes; 1,750,000 microforms; current subscriptions to over 8,700 serials and newspapers; 160,000 government documents; and 14,000 audio, video, and computer software titles.

Library staff are available in all service areas to assist students, including students with disabilities. Librarians provide instruction to groups and to individuals on the bibliographic research process and on strategies for identifying, locating, and using information resources. Each term, a series of tutorials is offered giving students further opportunities to meet with a librarian to discuss particular or specialized research needs.

Northeastern University is a member of the Boston Library Consortium, a cooperative arrangement among the following academic and research institutions: Boston College, Boston Public Library, Boston University, Brandeis University, Marine Biological Laboratory/Woods Hole Oceanographic Institution, Massachusetts Institute of Technology, Northeastern University, the State Library of Massachusetts, Tufts University, the University of Massachusetts (Amherst, Boston, Dartmouth, and Lowell campuses), and Wellesley College. The University's membership in the Boston Library Consortium generally allows for on-site use by, but does not grant borrowing privileges to, students at Northeastern. Some of the consortium libraries and many of the other libraries in the Boston area require that a visiting student present a special pass or letter of introduction. A Northeastern reference librarian can advise about such student visitor policies.

Engineering Computer Center

The Engineering Computer Center provides user support for Northeastern Engineering and Technology students and faculty. The staff are full-time professionals who administer the systems, deliver training, maintain hardware and provide software support. The center's labs, open seven days a week with competent user assistants available to answer questions, provide access to UNet, a University-wide network, and Internet, a global network. These networks

provide access to software for educational and research application in a variety of engineering disciplines. The hardware is distributed among 486 PCs, Macintoshes, and UNIX workstations.

Division of Academic Computing

The Division of Academic Computing (DAC) facilitates the use of computers by Northeastern students and faculty.

The division's Personal Computing Initiative supports personal computing with negotiated discounts on hardware and software (available through the Northeastern Computer Store) and with advice, training, and assistance on personal computer use.

The division and its Computing Resource Center (CRC) maintain the *lynx* communication system for the exchange of computer mail and conference discussions. Participation in *lynx* is available to any member of the Northeastern community free of charge. To apply for a *lynx* account, bring a valid Northeastern student identification card to 39 Richards Hall during business hours.

The Computing Resource Center also maintains mainframe computing resources (most notably the VAX 8650 system) and numerous public-access laboratories of personal computers and terminals on the Boston, Dedham, Burlington, and Liberty Square campuses.

Ell Student Center

The Carl S. Ell Student Center is home to Northeastern's 185 student organizations—coordinated by the Student Activities Office—and such central facilities as the Student Government offices, the Information Center, *The Northeastern News*, the yearbook, WRBB radio station, and the food court. Supported by student fees, the center also houses a computer lab, meeting rooms, lounges, the Commuter Referral Office, and the ballroom, which serves many social and academic functions.

The Ell Center offers a comfortable setting for commuter and resident students and hosts many of the social, recreational, academic, and cultural activities held on campus.

Currently, a major renovation of the Ell Student Center is underway, with a completion date anticipated by Fall 1995. The remodeled center will feature new food vending, additional seating, and an indoor quadrangle. Indoor balcony spaces overlooking events, performances, and activities in the quad will enhance student participation in the center.

Recreational Facilities and Programs

University College and School of Engineering Technology students have access to the Cabot recreational facilities and programs. These include pool, indoor track, three weight rooms, basketball courts, and stretching and light activities rooms. Intramural team and individual sports are also offered, including basketball, softball, volleyball, tennis, broom-ball, flag football, innertube water-polo, soccer, ice hockey, racquetball, and aerobic classes. To use the Cabot recreational facilities and programs, enrolled part-time students show part-time ID cards and their photo IDs. For more information, please call the Cabot Center at 617-373-4433.

Social and Professional Clubs

We welcome and encourage part-time students in the School of Engineering Technology and University College to join in the social and professional activities that are organized and run by the student body, with the assistance of the director of the Office of University College-School of Engineering Technology Student Activities. If you and your peers are interested in starting new professional clubs, the office will help to plan and organize locally and nationally.

All programs are designed to keep pace with changing student needs and interests and to provide maximum opportunity for your participation.

Disability Resource Center

The Disability Resource Center's (DRC) mission is to enable people with disabilities equal access to higher education via support services and advocacy. The center provides support services

on an individual basis. Accommodations include but are not limited to: orientation, quarterly registration assistance, counseling, referral, and HP parking.

Before receiving services, individuals must voluntarily register their disability-related needs with the DRC. Registering requires providing the DRC with recent diagnostic documentation of their disability. The center's services are individually designed to meet the student's needs.

The Counseling Center

Confidential counseling and testing is available to full- and part-time students to address career, educational, or personal concerns. Assistance is available to all students during days and one weekday evening until 8:30 PM at the Counseling Center. For information and appointments, call 617-373-2142 or drop in at 302 Ell Building.

Lane Health Center

A comprehensive program of medical care is provided to all students registered in full-time Basic Colleges and Graduate School programs at the Lane Health Center, 135 Forsyth Building. The medical staff is generally available Monday-Friday 9:00 AM-5:00 PM and a nurse is on duty at all times when the clinic is closed. An emergency telephone number (617-373-2772) is answered by the nurse on duty who will make appropriate arrangements for any urgent situation—nights, weekends, and holidays. Students are encouraged to schedule appointments at Lane Health Center.

Department of Career Services

The Department of Career Services provides a variety of professional development services to Northeastern students and alumni/ae. The services enable students to plan for career advancement. Students already working in their chosen fields may receive assistance in identifying career paths and developing a network of professional contacts. Others may receive assistance with career placement.

Services available to students and alumni/ae include career counseling, job search seminars, career expos, and resume matching. Students and alumni/ae may use the Career Resource Center, which contains valuable career planning material, a job bank of employment opportunities, the Northeastern National Career Network, and files on over 1,200 companies.

The On-Campus Recruiting program offers students receiving a bachelor's degree in the current academic year the opportunity to interview on campus with representatives of business, industry, government, and nonprofit organizations. Over 250 employers conduct interviews on campus during the fall and winter recruiting seasons.

The department is located on the Boston campus in 120 Ryder Hall. Counselors are available to students and alumni/ae by appointment. Office hours from September to June are 8:30 AM–4:30 PM Monday, Thursday, and Friday; and 8:30 AM–7:00 PM on Tuesday and Wednesday. Office hours during July and August are 8:00 AM–5:00 PM, Monday through Thursday. For further information or an appointment, call 617-373-2430 (voice), 617-373-2432 (TTY).

Cooperative Plan of Education

The University is known worldwide for its cooperative plan of education, under which students alternate periods of paid, professional work and study. Our time-tested, widely acclaimed method of education enables students to gain valuable hands-on, practical experience in their chosen fields as an integral part of their college programs. All of Northeastern's undergraduate day colleges operate on the cooperative plan, and several of the University's graduate schools have structured their programs to include the features of cooperative education.

Alumni Association

Upon graduation, you will join the more than 124,000 alumni united worldwide within the Alumni Association, which was established to promote a mutually rewarding relationship between Northeastern and its graduates.

Association activities include the Homecoming celebration, NU Night at POPS, the Downtown Breakfast Club Series, Sons and Daughters of Alumni Reception, presentation of the Outstanding Alumni Awards, and the annual presentation of Professional Promise Awards to outstanding seniors in each of the colleges. Free Alumni Association Membership Cards provide access to University facilities. Call the association at 617-373-3186.

Administrative Information

Admissions

The Student Body

The student body of the School of Engineering Technology is composed of both recent high school graduates and adults. Most students are employed in industry, with a range of vocational experience. They represent many technical career categories—industrial, engineering, scientific, and allied-medical, demonstrating that, in our increasingly complex society, the key to personal advancement is education.

Academic Background

A firm knowledge of the fundamentals of mathematics and science is necessary for success in the more advanced technological courses.

All applicants to the School of Engineering Technology are required to be proficient in both English and mathematics. In order to enroll in ENG 4100 Critical Writing 1 or MTH 4107 College Algebra, you must satisfactorily complete an English and a mathematics skills test.

Students who lack the required English or mathematics skills must take the appropriate review course. In addition, students who feel uncomfortable with the level of their English or mathematics skills are encouraged to enroll in review courses as well. The next paragraphs describe the review courses available. The review courses are not for credit toward degree requirements.

ENG 4005, ENG 4006, and ENG 4007 English for International Students 1–3

This is a three quarter sequence of courses for non-native English speakers that provides intensive training in the English language. Students are introduced to English grammar, with an emphasis on listening, speaking, and writing. The preparation of written and oral reports, as well as business and social correspondence, is required. In the final quarter, advanced work in written and spoken English prepares the students for ENG 4100 Critical Writing 1.

ENG 4011 Elements of Writing

This is a writing course that reviews English grammar, and offers practice in writing sentences, paragraphs, and short papers. The course prepares students for ENG 4100 Critical Writing 1.

MTH 4006 Technical Mathematics

This is a mathematics course that reviews high school algebra and prepares students for MTH 4107 College Algebra.

Program Counseling

If you are attending the School of Engineering Technology for the first time, we recommend that you meet with a program counselor who will assist you in planning an academic program. (If possible, please bring school transcripts to the counseling session.) Counselors are available evenings and Saturdays at the main campus in Boston most of the year; a special schedule is prepared for the summer. Counseling at the Burlington, Dedham, and Marlboro campuses is available on selected evenings during the registration period prior to each quarter. For further information, contact the School of Engineering Technology at 617-373-2500.

Special Students

Our open enrollment policy allows you to enroll in courses without making a formal application. As long as you have the proper prerequisites or their equivalent, you can enroll as a special student.

Degree Candidates

To graduate from the School of Engineering Technology you must be accepted as a degree candidate in a program. An application for degree candidate status is available from the School of Engineering Technology office in Boston (120 Snell Engineering Center, 617-373-2500).

To declare a major, you must do the following.

1. Complete sixteen quarter hours in the School of Engineering Technology degree program at a minimum cumulative quality-point average of 2.00 (a grade of C).
2. Present a high school diploma or its equivalent (GED).

Once your application for admission to a degree program is approved, a change of status will be recorded on your permanent record and any advanced standing credit will be posted.

Full-Time Students

In addition to the part-time programs described in this publication, the School of Engineering Technology offers full-time day cooperative education programs. Interested students can apply through the Office of Undergraduate Admissions, 617-373-2200.

Readmission

If you are a former student seeking readmission to the School of Engineering Technology, we suggest you schedule a meeting with a program counselor to determine how program changes may affect course requirements. We recommend that you bring a copy of your previous curriculum worksheet and a transcript.

Transfer Students and Advanced Standing Credits

If you are transferring from a community college, junior college, technical institute, or other college or university, you may transfer applicable credits toward the degree requirements of a program in the School of Engineering Technology.

If you are admitted with transfer or advanced standing credits from another institution, you must meet the requirements for admission as set forth under the regulations stated. (See "Degree Candidates," page 57.) Advanced standing in the School of Engineering Technology may be obtained by transfer of credits, proficiency examination, or by completing the College Level Examination Program (CLEP).

Transfer of Credits

You may receive, subject to the approval of the Academic Standing Committee, credits for academic work completed in other approved schools, colleges, or universities if the following criteria are met: the content of the course being submitted is equivalent to that of the corresponding School of Engineering Technology course; the grade achieved in the course submitted is C or higher; and the remoteness of the time of study does not negate its use as a prerequisite for an advanced course.

If you desire advanced standing credits by transfer, you must file a petition for transfer credit. You should ask the registrar of the institutions previously attended to mail an official transcript to the School of Engineering Technology, 120 Snell Engineering Center, Boston, Massachusetts 02115.

Proficiency Examinations

If you are a degree candidate in good academic standing and you do not meet all the criteria for the normal transfer of credits but are able to supply evidence of sufficient knowledge of a technical subject, you may petition for a proficiency examination. Knowledge can be demonstrated through job experience or by completing noncredit continuing education courses such as those offered by Northeastern's Building Design and Construction or State-of-the-Art programs. After paying the proficiency examination fee and demonstrating proficiency as indicated by the examination, you will receive advanced standing credit. For information on the limits set for proficiency examinations, contact the School of Engineering Technology, 617-373-2500.

College Level Examination Program

The School of Engineering Technology awards college credit under the College Level Examination Program (CLEP). This program is designed to enable individuals who have reached college-level education to demonstrate their achievement through testing and to receive college credit applicable toward a degree program. (The examination measures basic proficiency in the arts and sciences.) After paying the exam fee and receiving a passing score, you will be awarded advanced standing credit. For further information, contact the School of Engineering Technology, 617-373-2500.

Registration

Selecting Courses During Registration

Courses offered by the School of Engineering Technology are listed in the "Course Descriptions" section of this *Bulletin*. (See page 33.) Part of each course's entry lists in which quarters the course is offered. Because most courses are not offered every quarter, you should plan your course load for the entire academic year, not just the next quarter. Academic counseling is available to help plan your course load for the year. If you need help, contact a School of Engineering Technology program counselor at 617-373-2500.

Guidelines for Registering for Electives

Many of the School of Engineering Technology's degree programs require the completion of electives. The electives give you the chance to explore topics beyond the core curriculum's scope or to gain expertise in a specific area introduced by the core courses.

There are three categories of electives: open, technical, and social science/humanities.

Open Electives

Any course is acceptable as an open elective except physical education, military science, and preparatory courses. An open elective may be either a three or a four quarter-hour course depending on your major.

Social Science/Humanities Electives

Social science/humanities electives are offered through University College and must be chosen from a list that is available from the School of Engineering Technology. Six quarter hours of the social science/humanities electives must be chosen from the communication studies (CMN) category for certain majors.

Technical Electives

Technical electives must be chosen from the list of suggested technical electives appearing at the end of the degree curricula. Students wishing to take an upper-level course that does not appear on the list must petition for permission before attending the class. Students should submit a proposed program of elective courses for approval by the program coordinator. Electives preferably represent a minor field of concentration consistent with personal career objectives.

Registration Periods

Official registration periods are scheduled for each quarter during the academic year. We strongly recommend that you register for courses during these periods. The registration dates, times, and locations are listed in the enclosed Fee Schedule and Academic Calendar.

Before the registration period begins, get a copy of the *University College and School of Engineering Technology Schedule* for the next quarter. The *Schedule* provides you with the meeting times and locations of the courses being offered during the next quarter. To get a copy of the *Schedule*, contact the School of Engineering Technology at 617-373-2500.

Changes in Registration

You can change the courses you are registered in by filing a course drop form at the registrar's office, 120 Hayden Hall, and then registering for the desired course. We suggest that you make these changes during the official registration period, if possible.

Cross-Registration

Basic College students registering for School of Engineering Technology part-time courses may do so only to clear deficiencies or to follow a program approved by the appropriate program coordinator. Basic College students may register for part-time courses only by completing the registration form available in the School of Engineering Technology office by the end of the first week of the quarter. You must *not* fill out any other part-time registration materials. Approval of the program coordinator must be obtained if the course does not appear on your approved program sheet. Approval from the Department of Cooperative Education is required if you take more than one course during a co-op term. Upon completion, approval, and submission of the registration form, you will be registered automatically for the course. If the course is a substitute for a day course, the latest grade received is considered for quality-point calculations. If you do not appear on the part-time roster you will not be admitted into the class unless you have an approved registration form. In all instances, Basic College students must adhere to the academic and administrative requirements of the School of Engineering Technology part-time course.

Part-time School of Engineering Technology students who have been enrolled at Northeastern University for one or more quarters are eligible to register for a limited number of Basic College day courses. This policy is designed to accommodate previous School of Engineering Technology students who have experienced employment changes that make it impossible for them to continue part-time studies. If you are eligible, you may register for eight quarter hours of day course credit per quarter for a maximum of three academic quarters. Since you will be a part-time evening student in Basic College courses, tuition, fees, student services, and space availability will be based on part-time rates and departmental policy. If you are interested, you must first determine if a specific course is offered in the University, complete the registration form in the School of Engineering Technology, and have the form approved in both the bursar's and registrar's offices. At this point the academic department will determine space availability.

Academic Standards

Campus Locations

All courses are offered at the main campus in Boston, with some courses available at the Suburban Campus, Burlington; Burlington High School; the Dedham Campus; and Marlboro High School. Refer to the "Campus Maps" section. (See page 81.)

Quarter Calendar

Northeastern University operates on a quarter-system calendar. All courses are evaluated in terms of quarter-hour credit. A quarter-hour credit is equal to three-fourths of a semester-hour credit.

Class Session

Classes at Northeastern are scheduled in different modules. In assessing quarter-hour weight for courses, the following statement applies: One quarter hour of credit is equal to approximately fifty minutes of instruction per week, plus two hours of individual study.

Coursework

Various methods of instruction will be used in the course of your studies: lectures, home assignments, class projects, laboratory work, irregularly scheduled quizzes, and formal examinations. In addition, you will complete midterm examinations in most courses and a final examination at the completion of all courses. You are responsible for fulfilling all the requirements of a course. In the event of absence, you must make appropriate arrangements for makeup with the instructor.

Attendance

Chronic absence from regularly scheduled sessions in any subject, for whatever reason, may seriously jeopardize your academic progress and status. You are expected to attend all sessions scheduled in your courses. Excessive absence during a quarter may be sufficient cause for the registrar to remove the course(s) from your schedule.

Withdrawal

Students who wish to withdraw from a course must complete a Course Drop Form, available from the registrar representative at any campus location. Ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. Students who withdraw from a course prior to the end of the seventh week of a term (please refer to the specific deadline in each *Schedule Guide*) will have no record of the withdrawal on their transcripts. Students may withdraw from the beginning of the eighth week to the end of the week prior to final examinations but the withdrawal will be noted on their transcripts. No withdrawals will be allowed for any reason during the week that final examinations are given.

In addition, the registrar will withdraw you from a course if you do not attend the first three classes at the beginning of the quarter or the first two classes at the beginning of a summer term.

Grading Systems

You are required to maintain appropriate grades, quality-point average, and the quantitative credit requirements of your program to satisfy academic progress criteria and graduate from the School of Engineering Technology.

The following grading system is used. The numerical equivalent for each grade is in parentheses.

A	(4.000)	Outstanding attainment
A-	(3.667)	
B+	(3.333)	
B	(3.000)	Good attainment
B-	(2.667)	
C+	(2.333)	
C	(2.000)	Satisfactory attainment
C-	(1.667)	
D+	(1.333)	
D	(1.000)	Poor attainment
D-	(0.667)	
F	(0.000)	Failure
I	—	Incomplete (letter-graded course)
L	—	Audit (no credit)
S	—	Satisfactory achievement in a pass-fail course; counts toward degree requirements
U	—	Unsatisfactory achievement in a pass-fail course
W	—	Course withdrawal
X	—	Incomplete in a pass-fail course
*	—	Grade not received

A general average of D is unacceptable and will not allow you to continue in the School of Engineering Technology or to receive a degree from Northeastern University. If you receive an F, you can clear the failure by repeating and passing the course.

Pass/Fail Courses

If you are a *degree candidate* in good academic standing and have completed forty quarter hours in a School of Engineering Technology degree program, you may register for one pass/fail course. Thereafter, you may register for one course on a pass/fail basis for each ten quarter hours of successfully completed work up to a maximum of nine quarter hours of pass/fail credit. You must obtain written permission from the appropriate academic dean or designee and approval of the instructor. You may not register for more than one pass/fail course per quarter. Pass/fail courses are restricted to social science/humanities electives only.

If you are a *nondegree candidate*, do not intend to become a degree candidate, and are making good academic progress, you may register for a course on a pass/fail basis with written permission from the appropriate academic dean or designee and approval of the instructor. You may not register for more than one pass/fail course per quarter.

If you become a degree candidate, you may use only nine quarter hours of social science/humanities elective credit, where applicable.

Auditing a Course

You can audit courses by filing the usual registration forms and paying the regular tuition fees. There is no reduction in fees for auditing. Your decision to audit must be communicated in writing to the registrar prior to the fourth class meeting. As an auditor, you may participate in class discussion, complete papers and projects, and take tests and examinations for informal evaluation if desired. However, regardless of the amount or quality of work completed, *no academic credit will be granted at any time for courses audited.*

Makeup Examinations

Midterms

If you are absent from a midterm examination, you may request that your instructor grant permission to take a makeup examination; you do not automatically have the right to make up a missed examination. If permission is granted, arrange to have your instructor coordinate with you and the School of Engineering Technology a day and time for you to take the examination. All examinations will be administered on the Boston campus by the School of Engineering Technology office, 120 Snell Engineering Center, during regular office hours. *There is no fee for a midterm makeup.*

Finals

If you are absent from a final examination, you will receive a grade of I (Incomplete) for the course. You do not automatically have the right to make up a missed final examination; you must file a petition for a missed final according to the published schedule. Petitions may be obtained from the School of Engineering Technology office, 120 Snell Engineering Center, 617-373-2500. If the petition is granted, *you must pay a fee before taking the special examination.* (See enclosed Fee Schedule and Academic Calendar.)

You will be notified when and where to take the final examination; all are administered on the Boston campus. If you do not take makeup final examinations as scheduled, you will forfeit the makeup privilege.

Quality-Point Average

The quality-points you earn in a given course are determined on the basis of your letter grade and the credit hours carried by the course. The total quality-points earned, divided by the total number of credit hours, constitutes the quality-point average.

- 1. When you receive more than one grade in the same course, the most recent grade will be used to calculate a quality-point average.
- 2. A grade of I (Incomplete) will not be considered in the final calculation.
- 3. If you are a transfer student, you can receive advanced standing credits (ASC) for work completed at other institutions. While these credits count toward completion of degree requirements, neither the credits nor the grades earned in such courses are included in quality-point averages.
- 4. In programs made up of combined University College and School of Engineering Technology courses, your cumulative quality-point average will include all work in both colleges.

For example, if you have registered for thirteen courses, cleared a failure in one of them, cleared an incomplete in another by repeating the course, and received advanced standing credit in another, you may calculate the quality-point average as follows.

Grade Achieved	Numerical Equivalent	×	Credit Hours	=	Quality Points
A	4.000	×	4	=	16.000
A-	3.667	×	3	=	11.001
B+	3.333	×	3	=	9.999
B	3.000	×	4	=	12.000
B-	2.667	×	2	=	5.334
C+	2.333	×	2	=	4.666
C	2.000	×	4	=	8.000
C-	1.667	×	3	=	5.001
D+	1.333	×	2	=	2.666
D	1.000	×	3	=	3.000
D-	0.667	×	2	=	1.334
F	0.000	×	2	=	0.000
FB	3.000	×	3	=	9.000
I	-	×	-	=	-
IC	2.000	×	2	=	4.000
ASC	-	×	-	=	-
Totals			39		92.001

QPA = $\frac{\text{Total Quality Points (92.001)}}{\text{Total Credit Hours (39)}} = 2.359$

The registrar cannot confirm calculations of quality-point averages. Each student's record is updated before graduation. In the meantime, borderline cases can be checked by a School of Engineering Technology counselor.

Grade Reports

The registrar's office will mail you a grade report that indicates both the quarterly quality-point average and the cumulative quality-point average. University regulations prohibit issuing grades by telephone.

Academic Progress Criteria

You are expected at all times to strive for a high record of achievement. The Academic Standing Committee reserves the right to review all students' records and deny readmission to those who fall below a minimum quality level of achievement. This requirement has been established as follows.

In order to remain in the college, you must have a quality-point average of at least: 1.40 at the completion of twenty-four quarter hours; 1.50 at the end of forty-eight quarter hours; and 1.60 at the end of seventy-two quarter hours.

If you accumulate the equivalent of six uncleared failures, you may be considered ineligible to continue your program of study.

Scholastic Probation

The Academic Standing Committee has the authority to dismiss from the school or to place on scholastic probation any student whose scholarship is deficient because of a low quality-point average or excessive outstanding failures, regardless of quality-point average.

A student on scholastic probation should be particularly diligent in current course work and make every effort to clear the academic deficiencies as soon as possible. Students whose academic records do not improve or whose failures are not properly cleared may not be allowed to register for further courses.

A student on scholastic probation who has cleared all or a substantial part of any outstanding failures may petition the Academic Standing Committee for removal from the probation list.

Disciplinary Probation

The Academic Standing Committee has the authority to dismiss from the school or place on disciplinary probation any student who is deemed unworthy because of conduct or character. The committee may ask any student to withdraw from the school who is obviously out of sympathy with its aims and ideals.

Graduation Requirements

To receive the degree of associate in engineering, associate in science, or bachelor of science in engineering technology, you must meet the following requirements.

1. Formal acceptance into degree candidate status by the Committee on Admissions.
2. Completion of all curriculum courses, either by attendance at the School of Engineering Technology or by receiving advanced standing credit.
3. Completion of associate degree programs within eight years and bachelor's programs within twelve years from the date of entrance into the School of Engineering Technology (extensions of time may be granted by the Academic Standing Committee).
4. Attendance for at least a year preceding the expected graduation date, and completion of at least one-fourth of the work in the School of Engineering Technology.
5. Maintenance of a minimum quality-point average of 2.00 in all courses in the major and a minimum overall quality-point average of 2.00.
6. Completion of additional credit amounting to at least one-fourth of the total hours required to be awarded more than one associate or bachelor degree.
7. You must petition for transfer of credits completed at other institutions prior to January 1 of the year in which you are to receive the degree.

Academic and Professional Awards

The academic programs offered by the School of Engineering Technology and the teaching, counseling, and professional efforts of the faculty and staff are aimed at motivating you toward the highest levels of academic achieve-

ment. To encourage scholarly and professional excellence and to recognize quality achievements, the following awards are made at appropriate times during the academic year.

Dean's List Scholars

All matriculated students maintaining honor grade averages—a minimum quality-point average of 3.00 and no grades below C during a quarter, while carrying a minimum of eight quarter hours of credit—are recognized as Dean's List Scholars. If you want a certificate attesting to this honor, contact the School of Engineering Technology office.

Graduation with Honor

Bachelor's degree candidates who have superior achievement will be graduated with honor, high honor, or with highest honor, depending on the final quality-point average as follows.

Graduation with honor	3.25–3.49
Graduation with high honor	3.50–3.74
Graduation with highest honor	3.75–4.00

To be considered for graduation with honor, a student must have completed a minimum of 72 quarter hours of work at the School of Engineering Technology. Courses transferred from other educational institutions will not be considered in determining honor graduates.

Awards

Technology Awards

The Technology Awards are presented annually to seniors pursuing associate degree programs who have achieved high-ranking cumulative academic records. Certificates are awarded at the annual Class Day Ceremony.

University Awards

The University Awards are presented annually to seniors pursuing baccalaureate degree programs who have demonstrated superior academic and professional capabilities in their fields. Appropriate certificates are distributed to outstanding students enrolled in the following program categories.

Aerospace Maintenance Engineering Technology
Computer Technology
Electrical Engineering Technology
Manufacturing Engineering Technology
Mechanical Engineering Technology
Mechanical-Structural Engineering Technology

Class Marshal Award

The Class Marshal Award is presented annually at the Class Day Ceremony to the top-ranking senior in a baccalaureate program. The award consists of a certificate and the President's Letter of Commendation.

Sigma Epsilon Rho Awards

This award is presented annually by Sigma Epsilon Rho, the evening colleges' scholastic honor fraternity. The highest-ranking students in University College and the School of Engineering Technology receive certificates and pins for outstanding scholastic achievement.

Tau Alpha Pi Awards

This award is presented annually by the Tau Alpha Pi National Engineering Technology Honor Society to recognize high scholastic achievement among students of the School of Engineering Technology. The award is intended to promote and encourage outstanding academic performance by offering membership in the society. Finally, the society hopes the award will strengthen the desirable qualities of personality, intellect, and character among its members. Inductees receive certificates and pins.

Alumni Award for Professional Promise

Established in 1947 by the Northeastern University Alumni Association, the Alumni Award for Professional Promise is presented annually at the Class Day Ceremony. The award is made to the senior who has demonstrated unusual professional promise through character traits, scholastic achievement, and professional performance.

Additional Opportunities at Northeastern

Educational Opportunities at Northeastern for Associate's Degree Graduates

Graduates of associate's degree programs in engineering technology or science technology programs may be able to transfer applicable credits toward the degree requirements of a baccalaureate program in engineering technology or operations technology at Northeastern.

For information about transferring associate's degree credits toward an engineering technology bachelor's degree, call the School of Engineering Technology, 617-373-2500. For information about transferring associate's degree credits toward an operations technology bachelor's degree, call University College, 617-373-2400.

In addition, engineering technology or science associate's degree graduates who maintained a quality-point average (QPA) of 2.75 may be able to transfer applicable credits toward a bachelor of science in engineering degree. For information, call the College of Engineering's student services office, 617-373-2154.

Educational Opportunities at Northeastern for Bachelor's Degree Graduates

Bachelor of science in engineering technology graduates who maintained a quality-point average (QPA) of 2.75 may be qualified to enter the College of Engineering's program leading to the bachelor of science in engineering degree. For information, call the College of Engineering's student services office, 617-373-2154.

Financial Information

Tuition and Fees

This section contains a brief description of the fees and charges that the University assesses for instruction or other services. The actual fee amounts are listed in the enclosed Fee Schedule and Academic Calendar. If you do not have a Fee Schedule and Academic Calendar, you can request one by calling 617-373-2500.

Tuition rates, all fees, rules and regulations, courses, and course content are subject to revision by the President and the Board of Trustees at any time.

Registration and Tuition Fees

As a new student, you will be charged a one-time, nonrefundable registration fee. This fee is included in your tuition bill.

Students are permitted to audit courses, but there is no reduction in fees for auditing.

You may not attend class sessions or take any examination until you have paid your tuition or have made satisfactory arrangements for payment.

You will not be advanced in class standing, nor permitted to re-enroll in the University, nor have degrees conferred until all financial obligations to the University have been met.

If you are assigned to courses in other departments or colleges of the University, you will be charged tuition and other fees effective in those departments.

Late Payment Fee

A late fee is assessed on all accounts for students who fail to make payments.

Refund of Tuition

The general tuition refund policy in all schools and colleges of the University is as follows.

The University provides instruction on a quarterly basis for which you must pay at the

beginning of each quarter. Tuition refunds are granted for official withdrawal from a course through the first four weeks of a quarter.

Tuition refunds are granted only on the basis of the date appearing on the official withdrawal application filed with the registrar, 120 Hayden Hall. *Nonattendance does not constitute official withdrawal.* Requests for refunds must be made through the Office of the Bursar, 254 Richards Hall.

Refunds will be granted in accordance with the following schedule.

<i>Official withdrawal filed within</i>	<i>Percentage of tuition</i>
1st week of quarter	100%
2nd week of quarter	75%
3rd week of quarter	50%
4th week of quarter	25%
5th week or later	0%

Tuition Underwritten by Employers

If tuition is being paid directly by your employer to the University, you should give the Office of the Bursar a purchase order or a statement from an officer of the company, certifying that the company is underwriting the tuition.

Many companies, however, do not pay the University directly but will reimburse employees upon successful completion of each course. In such cases, you are responsible for payment in full at the start of each quarter.

You may choose to pay in installments on the extended payment option. However, tuition may not be left unpaid pending employer reimbursement.

Failure to make payments in accordance with these regulations will result in a late payment fee.

If you have any questions about student accounts, please direct them to the student account bursar, 254 Richards Hall, 617-373-2270.

Student Center Fee

If you attend the main Boston campus in the evening in a part-time program of study, you will be assessed a nominal student center fee.

Parking Registration Decal Fee

If you park in the Boston or Burlington campus lots, you must obtain a parking registration decal by the beginning of the second week of the quarter. You may pay the fee at the cashier's office, 248 Richards Hall.

Medical Insurance

The Commonwealth of Massachusetts requires all Northeastern University students who are classified as full-time or enrolled in a degree program carrying nine or more credits to be covered by medical insurance. In compliance with the law, Northeastern University will automatically enroll you in its insurance plan and bill your student account for this coverage. The law allows you to waive the University's plan if you are covered by comparable medical insurance. Medical insurance waiver forms are available at the Bursar's Office, 254 Richards Hall.

Proficiency Examination Fee

Applicants may petition for advanced standing credit based on a "proficiency examination." There is a fee for each examination requested.

Transcript Fee

You can obtain a transcript at the registrar's office, 117 Hayden Hall. There is no charge for an unofficial transcript. The official transcript fee is payable in advance at the cashier's office, 248 Richards Hall. You must present a current picture identification card to obtain your transcript. Transcripts and other academic records will not be released until all financial obligations to the University have been met.

Textbooks and Supplies

You must purchase your own textbooks and work materials. The cost varies according to the subject. If you are enrolled in Engineering Graphics, you should be prepared to purchase drawing supplies and a set of drawing instruments, in addition to the textbook. If you are enrolled in a mathematics course, you should be prepared to purchase a graphing calculator, such as the TI-85, in addition to the textbook.

Financial Aid and Scholarships

The Office of Financial Aid, located at 356 Richards Hall, offers several types of assistance to part-time students. All awards are based on financial need. Aid granted from programs sponsored by the federal or state government is dependent upon the amount of funding allocated to Northeastern University. Federal regulations require that students who receive financial aid funds be United States citizens or permanent residents.

Application Procedure

All students applying for aid must submit a Free Application for Federal Student Aid (FAFSA) to the federal processor.

Federal regulations require that students submit a Financial Aid Transcript (FAT) from each school they have previously attended to the Office of Financial Aid before they can receive financial aid at Northeastern. This is required even if you did not receive aid at the other institution(s). If your transcript indicates you are in default on a loan or you owe a refund, you will be ineligible for all types of financial aid until this status is cleared.

Northeastern University also requires its students to complete an Institutional Application. This form gathers information that assists the office in determining a student's eligibility for aid.

All application materials are available at the Office of Financial Aid. Students should begin the application procedure at least twelve weeks before the start of the quarter in which they plan to enroll. Students must apply for financial aid each academic year.

In order to be eligible for financial aid, students must be admitted into a degree program prior to the beginning of the academic quarter. Students admitted after the start of the quarter will not be eligible for aid until the next academic quarter.

First-year students must submit a Letter of Provisional Matriculation from the School of Engineering Technology. A Letter of Provisional Matriculation is valid for one year. At the conclusion of the year, students must be officially admitted into a degree program in order to retain eligibility for aid.

Satisfactory Academic Progress

For all students who are receiving financial aid for the first time on or after July 1, 1987, satisfactory academic progress will be determined based on having achieved a 2.0 QPA after the completion of the second grade level and maintaining that minimum until completion of the degree. Students not achieving a 2.0 QPA or dropping below that minimum after their second grade level will not, by Federal law, be eligible for financial aid.

Financial Aid Programs

Financial aid to students is offered in the form of loans and grants. Available programs follow.

Federal Pell Grant

Based on a student's financial information, a student may be eligible for a Federal Pell Grant. The Federal Pell Grant Program is a federal aid program designed to provide financial assistance to undergraduate degree candidates. Approximately six weeks after a student has filed the FAFSA, the federal processor will send the student a Student Aid Report (SAR). The SAR must be submitted to the Office of Financial Aid to have a student's eligibility determined.

This program requires a student to be admitted into a degree program. If eligible for a Federal Pell Grant, the amount of the grant will vary depending upon the number of quarter hours a student enrolls in each quarter. Students with a prior bachelor's degree are not eligible to receive Federal Pell Grants.

State Scholarships

Based on financial information, a full-time student may be eligible for a state scholarship. When submitting the FAFSA, be sure to answer all questions regarding residency. Most states have application deadlines. Eligibility for state scholarships is based on need and is determined by the scholarship office in each state. Students will receive a letter from the state scholarship office notifying them of their eligibility. In order to be eligible for a state scholarship, a student must be admitted into a degree program and enrolled in at least twelve quarter hours per quarter. A student with a prior bachelor's degree is not eligible to receive a state scholarship. Contact your state scholarship office for more information.

Federal Stafford Loan Programs

Federal Stafford Loans are low-interest student loans available to students admitted to a degree program and enrolled on at least a half-time basis. Maximum loan levels are \$2,625 for the first year of study; \$3,500 for the second year; and \$5,500 for the third and subsequent years of undergraduate study. The maximum loan limit for undergraduate students is \$23,000.

In order to have a loan processed by the financial aid office, a student must have a complete financial aid application on file, have received a letter of eligibility from Northeastern, and have submitted a Federal Stafford Loan application. Applications for the loan are available from local lending institutions and the Office of Financial Aid.

Eligibility to participate in the **subsidized** Stafford Loan program is based on need in accordance with federal regulations. The federal government pays the interest on the loan while the student is in school. Repayment begins six months after enrollment falls below half-time.

Unsubsidized Stafford Loans are available to students who do not qualify financially for the subsidized loan. The unsubsidized loans are identical to the subsidized loans except that the federal government does not pay the interest on the loan while the student is in school. The student either makes regular interest payments or the interest is added to the loan's principal. Repayment begins six months after enrollment falls below half-time.

Repayment on loans may be deferred under certain circumstances. For details, contact your lender.

Students who borrow funds through this program must report any of the following changes to their lenders:

- withdrawal from school
- transfer to another school
- reduction of course load to less than half-time
- change of address or parents' address
- change of name

Additional information about financial aid is available from the Office of Financial Aid, 356 Richards Hall, 617-373-3190.

All federal financial aid programs are subject to change depending on adequate and continuing federal support.

Community Sources

Students and their families are urged to explore community, industrial, and foundation sources for collegiate financial aid. Parents' employers or the appropriate union organization may be a source. In addition, local, civic, political, religious, or educational leaders are often aware of aid sources in the immediate community. Some typical sources include PTA, Kiwanis, Lions, Elks, Knights of Columbus, Masons, Sons of Italy, Rotary, State Rehabilitation, or the American Legion.

Veterans' Benefits

Veterans covered by the Veterans Readjustment Act of 1966, Public Law 89-358, should report to 120 Hayden Hall to fill out the proper enrollment forms. Benefits depend on course load and increase sharply when a student takes more than eight quarter hours per quarter.

Students needing additional information about eligibility, allowances, or other details are urged to contact the local office of the Veterans Administration or the Veterans' Benefits Representative at 120 Hayden Hall, 617-373-2183.

Scholarships and Application Procedures

The School of Engineering Technology and University College scholarships and awards that follow are available to students who have been accepted as degree candidates and are in good academic standing.

Scholarships are awarded once a year by the Scholarship Committee. Final selection of scholarship recipients is usually made in late June, followed by the awarding of the scholarships in late July. Funds are usually applied to tuition expenses for the following academic year. Awards range in amount from \$500 to \$1,000.

In January, a mailing list of students who have requested applications is prepared, and applications are mailed out with the stipulation that they be completed and returned to the Scholarship Committee by March 31. To be placed on the January mailing list, call 617-373-2400 and leave your name and address.

Leslie B. Cutler Aviation Scholarship Awards

Established by the members of the Aero Club of New England in recognition of the late Senator Cutler's service and devotion to the interests of aviation, these awards are made to students who most typify the same interest, devotion, and leadership demonstrated by Senator Cutler during her long and distinguished public career.

Henry J. Doherty Memorial Scholarship Fund

Established in 1987 through the generosity of Doris R. Doherty as a tribute to her late husband, a 1953 graduate of the School of Business' evening program and a successful business leader in legal publishing. The income from the scholarship is awarded annually to deserving students with demonstrated financial need who are pursuing part-time evening study and have been accepted as degree candidates.

Kappa Tau Phi Scholarships

Granted annually to those women students in the arts and sciences, business, and engineering programs who rank highest at the end of the upper-middle year. If the chosen student is eligible for an award of greater monetary value, the award will be made to the next highest-ranking woman student. To be eligible for this scholarship, the student must be enrolled in a course that meets at least two evenings per week and must be a candidate for the bachelor's degree. In determining the recipient, grades of all courses completed in prior years shall be considered.

Robert G. Keene Memorial Scholarship Fund

Established in 1979 in memory of Robert G. Keene, a graduate of Lincoln College (now the School of Engineering Technology), Class of 1972, the endowment funds were provided by the friends and associates of Robert G. Keene and the Polaroid Corporation, where he served as an engineering manager. The income from the fund is awarded annually to an undergraduate in any college of the University who demonstrates financial need as well as strong character and initiative. Primary consideration will be given to children of Polaroid employees.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr., awards are made, as openings occur, to minority-group adults who would otherwise be unable to continue their education. Stipends will cover tuition expenses not to exceed six quarter hours in any academic quarter (excluding the summer quarter).

William J. McGovern Memorial Scholarship

Established in 1978 by an anonymous donor who wishes to assist others in realizing their potential through higher education and to honor the memory of William J. McGovern. The income from this scholarship will benefit worthy undergraduate students actively pursuing studies in the School of Engineering Technology or University College. Recipients must be matriculated, demonstrate financial need and academic achievement, and exhibit a high level of professional promise.

**Sigma Epsilon Rho Honor Society
Scholarship Award**

Established in 1974 by the membership of the society. Income from the fund is awarded annually to undergraduate student(s) of the School of Engineering Technology and/or University College at Northeastern University. Eligible students must have a cumulative quality-point average of 3.00 or better after completing 75 percent or more of the required studies.

H. Patricia Taylor Scholarship Fund

Established in 1974 by H. Patricia Taylor, a graduate of University College, and her husband, Harry C. Taylor, a graduate of the School of

Business, the scholarship expresses their appreciation for financial assistance made available to Mrs. Taylor while obtaining her degree, and is an attempt to provide similar funds to assist others in realizing potential through higher education. The income from the scholarship fund will be awarded annually to a student enrolled in University College or the School of Engineering Technology who demonstrates financial need and academic stability and who meets certain other conditions of eligibility.

**University College and the School of
Engineering Technology Faculty Society
Memorial Scholarship Awards**

The Faculty Society of University College and the School of Engineering Technology offer two awards annually, primarily for excellence in studies, to bachelor's degree candidates in University College and the School of Engineering Technology who have carried and are currently carrying a minimum of twenty-four quarter hours annually. Applications, available during the winter quarter, must be returned before the spring quarter. These awards are given in commemoration of the Faculty Society's deceased members.

**Mark Caldwell Whitney Memorial
Scholarship**

Established in 1981 by the family and friends of the late Mark Caldwell Whitney, an outstanding 1973 graduate of aeronautical technology. Income from the fund is awarded annually to a student with financial need who demonstrates academic stability. Preference shall be given to students interested in the aviation field or who are preparing for careers in transportation.

Appendix



Faculty

A listing of the School of Engineering Technology's faculty follows.

David S. Goldman, MS, PE (CA, MA, NH)
Associate Professor
Computer Technology

John E. Hajjar, PhD
Assistant Professor
Computer Technology

Eric W. Hansberry, MS
Associate Professor
Design Graphics

George F. Kent, MS, MBA, PE (CT, MA)
Associate Professor
Mechanical Engineering Technology

Nonna K. Lehmkuhl, MEd, MS
Program Coordinator and Associate Professor
Computer Technology

Frederick J. Nohmer, EdD
Assistant Professor
Electrical Engineering Technology

Masoud Olia, PhD
Lecturer
Mechanical Engineering Technology

Ronald E. Scott, ScD
Lecturer
Electrical Engineering Technology

Jerome Tapper, BSEE, PE
Lecturer
Electrical Engineering Technology

A listing of the School of Engineering Technology's part-time faculty follows. Each entry gives the faculty member's name; highest degree earned; professional affiliation; and University title, department, and year of appointment.

David J. Allen, MSCE
Consulting Engineer
Lecturer, Computer Technology (1985)

Arnold W. Almquist, MEd
Mathematics Instructor, Needham High School
Senior Lecturer, Mathematics (1967)

Prabhat K. Andleigh, MS, MBA
Systems Architect, Lotus Development Corporation
Associate Lecturer, Computer Technology (1992)

Robert B. Angus, MS
Consultant, Angus Associates
Senior Lecturer, Electrical Engineering Technology (1947)

Francis M. Antczak, BSEE
Senior Engineer, Mass. Electric Co.
Lecturer, Electrical Engineering Technology (1985)

Maureen P. Berggren, MEd
Mathematics Teacher, Quincy High School
Senior Lecturer, Mathematics (1965)

Wayne M. Bethoney, BS
Mechanical Engineer, AMMRC
Lecturer, Mechanical Engineering Technology (1982)

Jennifer A. Black, MS
Assistant Director, Graduate Engineering,
Northeastern University
Associate Lecturer, Computer Technology (1992)

Robert E. Bobeck, MEd
Senior Lecturer, Bristol Community College
Senior Lecturer, Engineering Graphics (1976)

Rosanne L. Bogan, MS
Staff Assistant, School of Engineering Technology,
Northeastern University
Associate Lecturer, Computer Technology (1994)

Azzouz Boulououar, MSEE
PhD Student, Northeastern University
Lecturer, Computer Technology (1987)

James Brown, MBA
Consultant, Custom Consulting
Lecturer, Manufacturing Engineering Technology (1983)

Kip A. Brown, BS
Programmer/Analyst, United States Department
of Transportation
Lecturer, Computer Technology (1982)

Thomas J. Bugos, PhD

Senior Software Engineer, Macsyma, Inc.
Lecturer, Computer Technology (1985)

Vincent K. Butler, MS

Senior Systems Specialist, NYNEX
Lecturer, Computer Technology (1982)

Robert W. Case, PhD

Coordinator for Day Mathematics, School of
 Engineering Technology
Senior Lecturer, Mathematics (1976)

Joan M. Chrusciel, MEd, MA

Mathematics Department Head, Quincy High School
Senior Lecturer, Mathematics (1980)

Wendell R. Collymore

Buyer, Polaroid Corp.
Senior Lecturer, Engineering Graphics (1976)

Richard J. Colvario, MEd

Database/Technical Support, Massachusetts
 Department of Revenue
Lecturer, Computer Technology (1987)

Roger T. Connor, MEd

Retired
*Senior Lecturer and Course Consultant, Calculus
 and Differential Equations (1953)*

Robert J. Cormier, BS, Registered Landscape Architect (CT, MA, NY, RI)

Site Planner and Land Architect, Self-Employed
*Lecturer, Architectural Engineering Technology
 (1984)*

James B. Corscadden, MEd, AMT

Principal, Ellis Mendell School
Senior Lecturer, Mathematics (1967)

William L. Crenshaw, MSME, PE

Senior Mechanical Engineer, US Army Materials and
 Mechanics Research Center
*Senior Lecturer, Mechanical Engineering Technology
 (1978)*

David C. Crockett, MSME

Senior Engineer, Raytheon Equipment Division
*Senior Lecturer, Mechanical Engineering Technology
 (1969)*

Gregory Czarnowski, MEd

Marketing and Advertising Consultant
Lecturer, Technical Communications (1982)

Thomas R. Deveney, MA

Principal, Thomas J. Kenny School
Senior Lecturer, Mathematics (1965)

Jane E. DeVoe, MA

Senior Lecturer in Mathematics, Northeastern
 University
Senior Lecturer, Mathematics (1980)

Douglas H. Diamond, BSEE

Program Manager, Analytical Systems
 Engineering Corp.
Senior Lecturer, Mathematics (1968)

Daniel L. Donabedian, MBA

Supervisory Industrial Engineer, Department of the
 Air Force
Associate Lecturer, Engineering Economy (1992)

Gerard C. Donovan, AS

President, Donovan Test Engineering Services
 Company
Associate Lecturer, Computer Technology (1993)

Leonard F. Dow, MS, PE

Staff Engineer, Boston Edison Co.
*Senior Lecturer, Electrical Engineering Technology
 and Course Consultant, Circuit Analysis and
 Circuit Analysis Laboratories (1970)*

William Dubie, BA, BS, MA

Technical Editor, Digital Equipment Corporation
Lecturer, Technical Communications (1986)

David P. Durant, MEd, MS

Teacher, Boston Latin School
Lecturer, Mathematics (1983)

Henry B. Eden, BA

Vice-President, Tech-Graphics
Senior Lecturer, Engineering Graphics (1957)

Walter E. Engstrom, MS

Physics Instructor, Braintree High School
Lecturer, Physics (1985)

Adolf J. Erikson, MBA, PE (MA)

President, A.E. Engineering Corp.
Senior Lecturer, Engineering Graphics (1966)

John M. Flaherty, PhD

President, Flaherty Research
*Senior Lecturer, Electrical Engineering Technology
 (1976)*

James J. Flannery, MS

Manager, Planning Research and Communications,
 Boston Edison Company
Lecturer, Electrical Engineering Technology (1980)

Donald W. Fogg, MSEE

Senior Engineering Scientist, Martin Marietta
*Associate Lecturer, Electrical Engineering
 Technology (1989)*

Mario R. Forziati, BET

Field Applications Engineer, Emulex Corporation
Associate Lecturer, Computer Technology (1990)

Constantine Fountzoulas, PhD

Materials Research Engineer, US Army Materials
 Technology Laboratory
Lecturer, Mechanical Engineering Technology (1985)

John J. Frazier, BS

Retired
Lecturer, Physics (1981)

Thomas G. Fratto, AM

Mathematics Teacher, Cambridge Rindge and
 Latin School
Lecturer, Computer Technology (1987)

Steven R. Geddis, MS

Project Leader, Database Technical Support,
 Massachusetts Department of Revenue
Associate Lecturer, Computer Technology (1992)

Mable D. Gholar

Electronic Technician, Northeastern University
*Associate Lecturer, Electrical Engineering
 Technology (1990)*

Bernard F. Goldstein, PhD

Manager/Controls, Dynamics Research Corp.
*Senior Lecturer, Electrical Engineering Technology
 (1974)*

Boris Gommerstadt, PhD

Associate Professor, Northeastern University
Lecturer, Mechanical Engineering Technology (1984)

Philip R. Haberstroh, MSED

Assistant Head Master, Boston Latin School
Lecturer, Mathematics (1981)

W. Dale Hall, SB, PhD

Technical Staff, MITRE Corp.
Lecturer, Mathematics (1981)

Djamel Hamiroune, MS

Teaching Assistant, Northeastern University
*Associate Lecturer, Mechanical Engineering
 Technology (1991)*

Francis R. Hankard, MS

Retired
*Senior Lecturer and Course Consultant, Physics
 (1946)*

Daniel H. Hornbarger, MS

National Systems/Support, Blue Cross of
 Massachusetts
Lecturer, Computer Technology (1986)

Charles E. Jacob, MSED, MLS

Retired
Senior Lecturer, Physics (1967)

Michael E. Jammal, MS

Principal Manufacturing Engineer, Modicon
 Incorporated
*Lecturer, Manufacturing Engineering Technology
 (1989)*

Arthur W. John, MS, MBA

Consultant
*Senior Lecturer, Electrical Engineering Technology
 (1968)*

Peter R. Jonietz, MS

Software Engineer, Computervision
Associate Lecturer, Computer Technology (1992)

John Joseph Joyce, MSED, MA

Director of Mathematics, Winchester High School
Lecturer, Mathematics (1983)

Barbara Kane, MS

Teacher, Department of Computer Education,
 Natick Public Schools
Associate Lecturer, Computer Technology (1993)

Stephen M. Kane, EdD

Associate Professor, Co-op Education,
 Northeastern University
Lecturer, Mathematics (1987)

Amin Karimpour, MSEE

Assistant Professor, Franklin Institute of Boston
Associate Lecturer, Computer Technology (1989)

Edward V. Kelly

Electronic Technician, Northeastern University
*Associate Lecturer, Electrical Engineering
 Technology (1991)*

John F. King, MBA

Consultant
*Associate Lecturer, Manufacturing Engineering
 Technology (1992)*

John J. Klein, MSEE

Retired
*Senior Lecturer, Electrical Engineering Technology
 (1949)*

Peter L. Kobs, MS

Writing Consultant, Digital Equipment Corp.
*Associate Lecturer, Technical Communications
 (1987)*

Abdelmadjid M. Lahlaf, PhD

Project Engineer, GEI Consultants, Inc.
*Associate Lecturer, Mechanical-Structural
 Engineering Technology (1987)*

James E. Lennox, MS

Principal Engineer, Polaroid Corporation
Associate Lecturer, Computer Technology (1988)

Demetre P. Ligor, MSEE, PE

President, Applied Measurements, Inc.
Senior Lecturer, Physics (1959)

John F. Limongelli, BSEE

Consultant

*Associate Lecturer, Electrical Engineering Technology (1988)***Guido W. Lopez, PhD**

Professor, Daniel Webster College

*Lecturer, Mechanical Engineering Technology (1988)***John F. Lutkevich, BBA**

Retired

*Senior Lecturer, Engineering Graphics (1956)***Michael R. MacNeil, BSBA**

Electronic Technician, Northeastern University

*Lecturer, Electrical Engineering Technology (1985)***Eliot A. Madow, BET**

Managing Associate, Coopers & Lybrand

*Lecturer, Computer Technology (1985)***Carl J. Mellea, MS, PE (MA, ME, NH, RI, VT)**

Project Manager Associate, Howard, Needles, Tammen & Bergendorff

*Senior Lecturer, Mechanical-Structural Engineering Technology (1960)***Amie Miller-Smith, BA**

Senior Technical Writer, Digital Equipment Corporation

*Associate Lecturer, Technical Communications (1991)***Vladislav Mlch**

Laboratory Technician, Northeastern University

*Associate Lecturer, Mechanical Engineering Technology (1991)***Nihar Mohanty, PhD**

Engineer, Environmental Protection Agency

*Associate Lecturer, Environmental Engineering Technology (1992)***Louis A. Moore, BSCE, RLS**

Chief Engineer, Commonwealth of Mass., Land Court, Boston

*Senior Lecturer, Mechanical-Structural Engineering Technology (1972)***Wassim G. Najm, PhD**

Electronics Engineer, Volpe National Transportation Systems Center

*Lecturer, Electrical Engineering Technology (1985)***Yesugey Oktay, MS, PE (CA, MA, ME, NY)**

Engineering Services, Boston Edison Co.

*Senior Lecturer, Mechanical-Structural Engineering Technology (1970)***Douglas J. Ordway, MEd**

Computer Coordinator, Boston Latin School

*Senior Lecturer, Computer Technology (1975)***Francis A. Pepicelli, BS**

Retired

*Senior Lecturer, Engineering Graphics (1976)***Walter J. Phinney, MBA**

Engineering Manager, Raytheon Missile Division

*Senior Lecturer, Engineering Graphics (1977)***Andronicos Phylactopoulos, MS**

Teaching Assistant, Northeastern University

*Associate Lecturer, Mechanical Engineering Technology (1991)***Dominic A. Piccione, MS, PE (MA, VA)**

Senior Engineer, Stone & Webster Engineering Corp.

*Senior Lecturer, Mechanical Engineering Technology (1966)***Richard H. Pike, MBA**

Lecturer, Northeastern University

*Senior Lecturer, Engineering Economy (1980)***Norman C. Poirier, MS, PE**

Research Associate, Northeastern University

*Senior Lecturer, Telecommunications (1966)***Dennis D. Poulin, MS**

Senior Microwave Systems Engineer, Hewlett-Packard

*Lecturer, Electrical Engineering Technology (1989)***Donald J. Poulin, BSIT, PE**

Retired

*Senior Lecturer, Electrical Engineering Technology (1970)***Daniel W. Pratt, MS**

Mathematics Department, Boston Latin School

*Senior Lecturer and Course Consultant, Mathematics through Pre-Calculus (1967)***Charles H. Price, Jr., MSEE**

Retired

*Senior Lecturer, Electrical Engineering Technology (1960)***Robert Rancourt, MSEE**

Electrical Engineer, MITRE Corp.

*Senior Lecturer, Mathematics (1984)***William S. Ricci, MS**

Materials Engineer, General Electric Aircraft Engineers

*Associate Lecturer, Manufacturing Engineering Technology (1992)***Edward P. Ricupero, MEd**

Head of Mathematics Department, Everett High School

Lecturer, Mathematics (1983)

Robert J. Ritchie, BS

Retired
Senior Lecturer, Engineering Graphics (1980)

Robert A. Rosenberg, ScD

Engineering Consultant, Stone & Webster
 Engineering Corp.
Senior Lecturer, Mechanical Engineering Technology (1983)

Thomas E. Ruden, MS

Principal Engineer, Raytheon Co. Missile
 Systems Labs.
Senior Lecturer, Physics (1967)

Annino D. Salvucci, AS

Mechanical Engineer, Micracor, Inc.
Lecturer, Engineering Graphics (1983)

Stephen Schwarm, BSEE

Senior Technical Consultant, Prime Computer Inc.
Lecturer, Computer Technology (1985)

Randall Seed, MS

Teaching Assistant, Northeastern University
Associate Lecturer, Electrical Engineering Technology (1994)

John W. Shaw, BSET

Field Service Engineer, Northeast Electronics, Inc.
Lecturer, Electrical Engineering Technology (1985)

Joseph E. Steffano, Sr., MS, MBA, PE (CT, MA, ME, NH, NY, PA, RI, VT), RLS (CT, MA, ME, NH, RI, VT)

Chief Engineer, Stone & Webster Engineering Corp.,
 Infrastructure Division
Senior Lecturer, Mechanical-Structural Engineering Technology (1965)

Harold J. Stengel, SB

Secondary Teacher in Mathematics, Boston Latin
 School
Lecturer, Mathematics (1982)

Robert E. Stewart, BS

Software Engineer, Textron Defense Systems
Associate Lecturer, Computer Technology (1991)

M. Carlton Storms, MEd

Teacher, Braintree High School
Senior Lecturer, Physics (1967)

Nabil S. Sukkar, MSCE

Project Manager, American Science and Engineering
Lecturer, Mechanical-Structural Engineering Technology (1984)

Raimundas Sukys, MS

Retired
Senior Lecturer, Electrical Engineering Technology (1962)

Donald M. Sullivan, MEd

Mathematics Teacher, Dedham High School
Lecturer, Mathematics (1984)

Paul A. Sullivan, BSET

Manager, New England Telephone
Associate Lecturer, Electrical Engineering Technology (1990)

James Surette

Laboratory Supervisor, Northeastern University
Lecturer, Mechanical Engineering Technology (1990)

David G. Sveden, MEd

Mathematics Instructor, Town of Needham
Senior Lecturer, Mathematics (1979)

Rena L. Tobias, MA

Research and Development Technical Specialist,
 Visibility, Inc.
Lecturer, Computer Technology (1985)

David K. Toebes, MSEE

Design Engineer, Raytheon Co.
Lecturer, Mathematics (1987)

John S. Travia, MSEE, PE

Retired
Senior Lecturer, Electrical Engineering Technology (1965)

Edward P. Tribuna, BET, FAA, A&P Certificate

Software Services Consultant, Digital Equipment
 Corporation
Lecturer, Electrical Engineering Technology (1985)

Paul T. Tsang, MS

Mechanical Design Engineer, Metcalf & Eddy
Lecturer, Mechanical Engineering Technology (1988)

John F. Videler, MS

Retired
Senior Lecturer, Electrical Engineering Technology (1968)

Michael P. Walker, MSCE

Structural Engineer, GEI Consultants
Associate Lecturer, Structural Engineering Technology (1993)

Joel R. Weinstein, BSEE

President, High Technology Marketing
Senior Lecturer, Computer Technology (1977)

James T. Welch, MS

Principal Engineer, Ungermann-Bass, Inc.
Senior Lecturer and Course Consultant, Computer Technology (1977)

Richard Whalen, MS

Teaching Assistant, Northeastern University
Associate Lecturer, Mechanical Engineering Technology (1992)

Joseph F. Willard, BS

Retired

*Senior Lecturer, Surveying and Highway
Engineering Technology (1949)***Albert G. Wilson, MS, PE, SE (IL)**

Retired

*Senior Lecturer and Course Consultant, Mechanical
Engineering Technology (1948)***Susan L. Wood, BSEE**

Software Engineer, Ungermann-Bass, Inc.

*Lecturer, Computer Technology (1984)***Bernie T. Woodrow, MS**

Loss Control Consultant

*Associate Lecturer, Manufacturing Engineering
Technology (1992)***Albert C. Yang, MS, MA, AIA**

Director, Research and Development,

Sigma Design, Inc.

*Associate Lecturer, Computer Technology (1991)***Robert T. Yosca, MA, MS**

Technical Instructor, Cognex Corporation

*Associate Lecturer, Engineering Probability and
Statistics (1982)*

Administration

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 Paul Farris, *Consultant*

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 Daniel Hornbarger, *Director, Government Programs Systems, Blue Cross of Massachusetts*
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 Roger Miller, *Software Engineer, General Dynamics, Electric Boat Division*
 Joyce Newhouse, *Executive Director, MassPep, Inc.*
 William Nickerson, *Power Production Manager, Taunton Municipal Lighting Plant*
 Charles Price, *Technical Staff, Mitre Corporation*
 Jeffrey Ross, *Staff Director, Network Engineering, New England Telephone Company*
 William J. Smith, *Senior Manager, MCI Telecommunications Corporation*

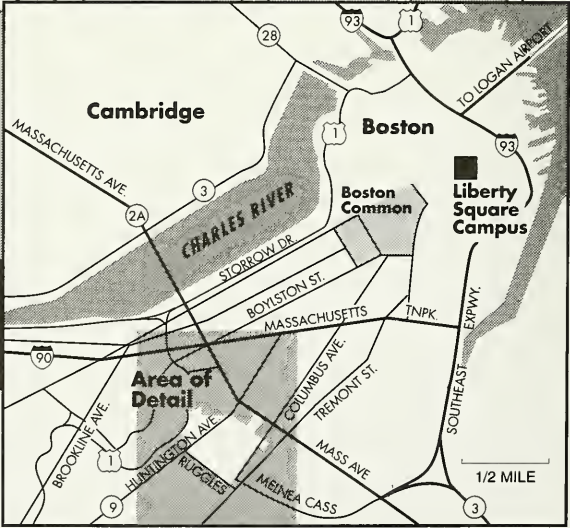
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 Rasma Galins, *Secretary*
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 Daniel W. Pratt, MS (Course Consultant, First-Year Mathematics through Pre-Calculus)
 Ronald E. Scott, ScD (Program Consultant, Electrical Engineering Technology, Day and Evening Programs)
 James Welch, MS (Course Consultant, Computer Technology Hardware Courses)

Campus Maps



Access to Boston



Directions

From the North

Route I-93 or
Route 1

At the merge with Route 3 (the Southeast Expressway), take the Storrow Drive exit and proceed to the Fenway exit. Follow signs for Boylston Street Inbound, and bear right at Westland Avenue, which leads to Massachusetts Avenue. Turn right onto Massachusetts Avenue, proceed to the third traffic light, and turn right onto Columbus Avenue. The Northeastern University Parking Garage is less than one-half mile on your right at 795 Columbus Avenue.

From the West

Route 90
Mass Turnpike

Take Exit 22 (Copley Square), and bear right. Proceed to the first traffic light and turn right on Dartmouth Street. Then take the next right onto Columbus Avenue. It is approximately one mile to the Northeastern University Parking Garage at 795 Columbus Avenue.

Route 9

Inbound

Proceed inbound on Route 9 until it becomes Huntington Avenue (approximately one-half mile after Brigham Circle), and take a right onto Ruggles Street. At the third traffic light turn left on Tremont Street, take the next left onto Columbus Avenue, and then turn right. The Northeastern University Parking Garage is two blocks on your left at 795 Columbus Avenue.

From the South

Route 3
Southeast
Expressway

Take Exit 18 (Massachusetts Avenue), and at the end of the ramp proceed straight onto Melnea Cass Boulevard. Continue for approximately two miles, and turn right onto Columbus Avenue. The Northeastern University Parking Garage is two blocks on your left at 795 Columbus Avenue.

By Public

Transportation

Take the commuter rail to Ruggles Station, Back Bay Station, or North Station. From Back Bay Station, transfer to the outbound Orange Line (to Forest Hills) for two stops. Get off at Ruggles Station, which is on one side of the Northeastern University campus. From North Station, take any Green Line train to Government Center; transfer to the outbound "E" Green Line train; get off at the Northeastern University stop (the first stop above ground).

Main Campus



Academic and Service Buildings

22	John O. D'Bryant African-American Institute (AF)	7	316 Huntington Avenue
12	Barletta Natatorium (BN)		(Northeastern at the YMCA) (BY)
19	Boiler Plant	54	Huntington Plaza
11	Cabot Physical Education Building (CB) TTY: Rm 110		(271 Huntington Avenue) (HN)
39	Cohners Hall (CA) TTY: Rm 151	10	Hurtig Hall (HT)
28	Corgill Hall (CG)	26	Kariotis Hall (KA)
13	Churchill Hall (CH)	41	Kerr Hall (Faculty Center) (KH)
59	Columbus Place	29	Knowles Center (KN)
	(716 Columbus Avenue) (CP)	25	Lake Hall (LA) TTY: Rm 203
56	Cotting School (CT)	57	Matthews Arena (MA)
9	Cullinane Hall (CN)	58	Matthews Arena Annex (MX)
40	Cushing Hall (CU)	20	Meserve Hall (ME) TTY: Rm 305
14	Dana Research Center (DA)	5	Mugar Life Science Building
27	Dockser Hall (DK) TTY: Rm 107		(Peabody Health Professions Center) (MU)
6	Dodge Hall (DG)	18	Nightingale Hall (NI) TTY: Rm 125
3	Ell Student Building (Auditorium) (EL) TTY: Rms 04,104	31	Parker Building (PA)
4	Ell Student Center (Student Lounge) (EC) TTY: Rm 255	2	Richards Hall (RI) TTY: Rms 150, 254
16	Forsyth Building (FR) TTY: Rms 100, 135	8	Robinson Hall (RB)
17	Forsyth Building Annex (FA)	21	Ryder Hall (RY) TTY: Rms 170, 180, 251, 270
38	Forsyth Dental Building (FE)	15	Snell Engineering Center (SN) TTY: Rm 120
1	Hayden Hall (HA) TTY: Rms 120, 202	60	Snell Library (SL) TTY: Reference Desk
33	Hillel-Frager (HF)	50	122 St. Stephen Street (SS)
24	Holmes Hall (HO) TTY: Rm 276	30	Stearns Center (ST) TTY: Rm 302
55	236 Huntington Avenue (HU)	32	26 Tavern Road (TA)

Key

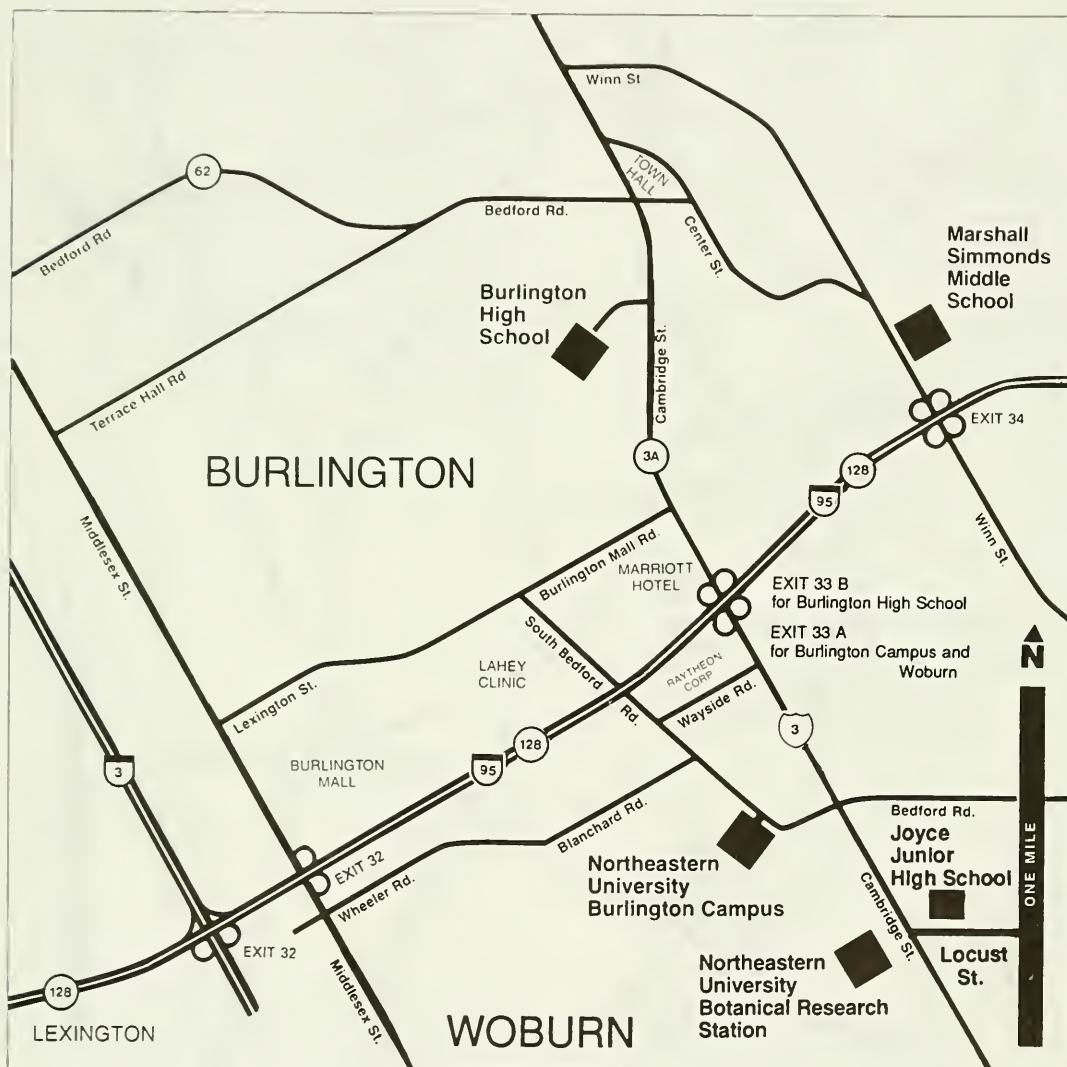
Academic, residential, and service buildings	
Handicap parking	
Accessible routes	
Parking areas	
Street direction	
Underground tunnel	
Emergency telephone	
TTY locations	
See alphabetic list of buildings for TTY locations.	

Maps are provided by the Information Center, 115 Richards Hall, extension 2736 (TTY extension 3768). Some buildings on this map are used but not owned by Northeastern University. 8/93

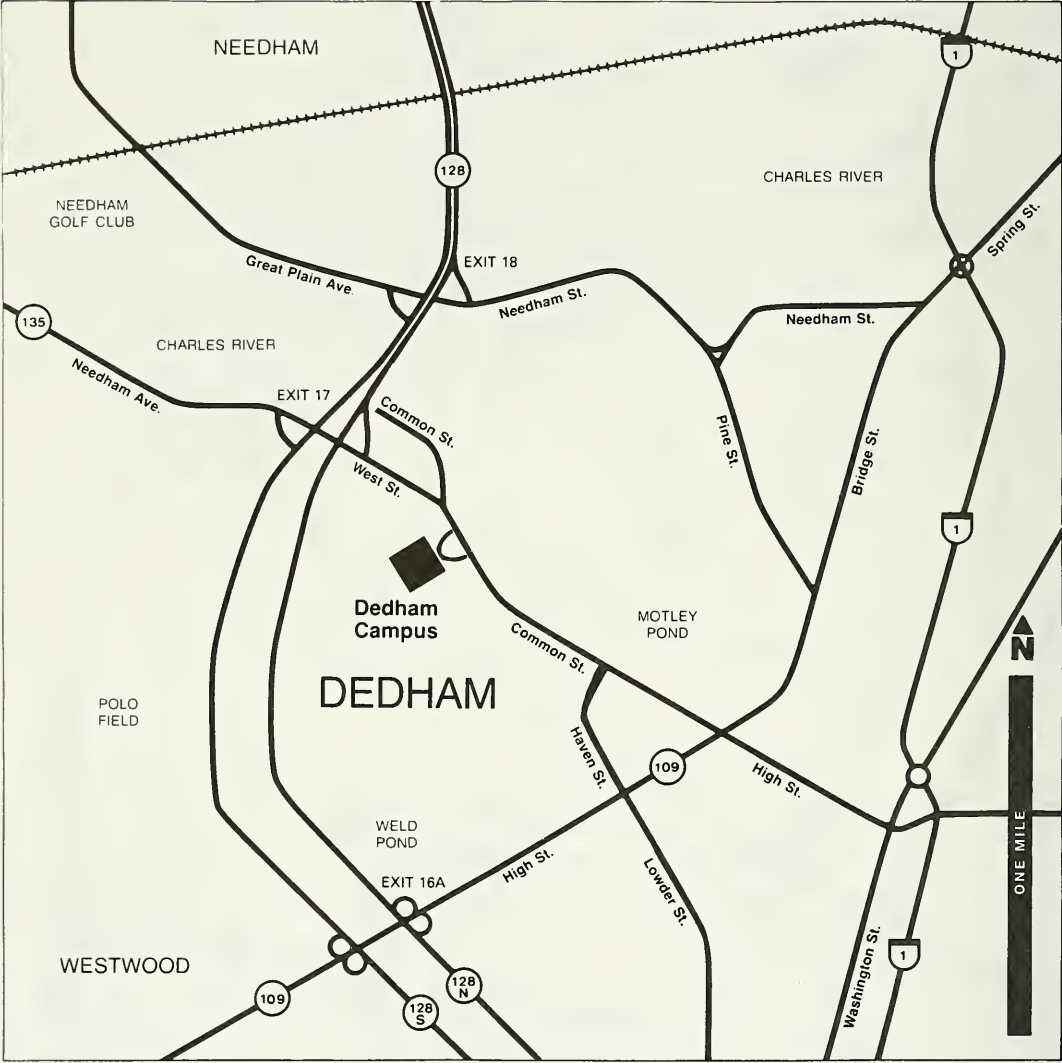
Residence Buildings

34	Burstein Hall	45	Loftman Hall and 153 Hemenway Street
43	Kennedy Hall	42	Melvin Hall
46	142-148 Hemenway Street	35	Rubenstein Hall
45	153 Hemenway Street and Loftman Hall	44	Smith Hall
7	316 Huntington Avenue	49	Speare Hall
	(Northeastern at the YMCA)	48	Stetson East TTY (public)
52	319 Huntington Avenue	47	Stetson West
51	337 Huntington Avenue	50	106/110/116/122 St. Stephen Street
36	407 Huntington Avenue	23	Willis Hall
41	Kerr Hall	37	White Hall
53	Light Hall	61	400 The Fenway

Burlington



Dedham



Marlboro



Accreditation Statement

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc.

Delivery of Services

Northeastern University assumes no liability for delay or failure to provide educational or other services or facilities due to causes beyond its reasonable control. Causes include, without limitation, power failure, fire, strikes by University employees or others, damage by natural elements, and acts of public authorities. The University will, however, exert reasonable efforts, when it judges them to be appropriate, to provide comparable services, facilities, or performance; but its inability or failure to do so shall not subject the University to liability.

The Northeastern University Undergraduate Catalog contains current information about the University calendar, admissions, degree requirements, fees, and regulations; however, such information is not intended and should not be regarded to be contractual.

Northeastern University reserves the sole right to promulgate and change rules and regulations and to make changes of any nature in its program; calendar; admissions policies, procedures, and standards; degree requirements; fees; and academic schedule whenever necessary or desirable, including, without limitation, changes in course content and class schedule, the cancellation of scheduled classes and other academic activities, and the substitution of alternatives for scheduled classes and other academic activities. In any such case, the University will give whatever notice is reasonably practical.

Northeastern University will endeavor to make available to its students a fine education and a stimulating and congenial environment. However, the quality and rate of progress of an individual's academic career and professional advancement upon completion of a degree or program are largely dependent on his or her own abilities, commitment, and effort. In many professions and occupations, there are also requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These requirements may change while a student is enrolled in a program and may vary from state to state or country to country. Although the University stands ready to help its students find out about requirements and changes in them, it is the student's responsibility to initiate the inquiry.

Disability Resource Center

The Disability Resource Center provides a variety of disability-related services and accommodations to Northeastern University's students and employees with disabilities.

Northeastern University's compliance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 are coordinated by the Dean and Director of the Disability Resource Center. Persons requiring information regarding the Disability Resource Center should contact Dean G. Ruth Bork at 617-373-2675 (voice) or 617-373-2730 (TTY).

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio and television when it becomes necessary to cancel classes because of extremely inclement weather. AM radio stations WBZ (1030), WEEI (590), WHDH (850), WRKO (680), and FM stations WBMX (98.5) and WFNX (101.7) are the radio stations authorized to announce the University's decision to close. Television stations WBZ-TV4, WCVB-TV5, and WHDH-TV7 will also report cancellations. Since instructional television courses originate from live or broadcast facilities at the University, neither the classes nor the courier service operate when the University is closed. Please listen to the radio or television to determine whether the University will be closed.

If a storm occurs at night, the announcement of University closing is given to the radio stations at approximately 6 AM. Classes are generally canceled for that entire day and evening at all campus locations unless stated otherwise. When a storm begins late in the day, cancellations of evening classes may be announced. This announcement is usually made between 2-3 PM.

Equal Opportunity Policy

Northeastern University does not discriminate on the basis of race, color, religion, sex, sexual orientation, age, national origin, disability, or veteran status in admission to, access to, treatment in, or employment in its programs and activities. In addition, Northeastern University will not condone any form of sexual harassment. Handbooks containing the University's nondiscrimination policies and its grievance procedures are available in the Office of Affirmative Action, 175 Richards Hall. Inquiries regarding the University's nondiscrimination policies may be directed to:

Ellen S. Jackson, Dean/Director
Office of Affirmative Action
175 Richards Hall
Northeastern University
Boston, Massachusetts 02115
617-373-2133

Inquiries concerning the application of nondiscrimination policies may also be referred to the Regional Director, Office for Civil Rights, U.S. Department of Education, J. W. McCormack Building, Post Office Court House, Room 222, Boston, Massachusetts 02109-4557.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it is necessary to do so. Specific details of the law as it applies to Northeastern are printed in the Student Handbook and are distributed annually at registration of the University College and graduate schools.

Fee Schedule and Academic Calendar

The Fee Schedule and Academic Calendar has been enclosed as a separate insert to this *Bulletin*. If one has not been enclosed, contact the School of Engineering Technology, 617-373-2500.

Full-Time and Day Programs

This *Bulletin* contains information about the evening and weekend programs offered by the School of Engineering Technology. If you need information about full-time or day programs offered by Northeastern University, contact the Department of Undergraduate Admissions, 139 Richards Hall at 617-373-2200.

Insufficient Enrollment Disclaimer

Northeastern University reserves the right to cancel any course if minimum enrollments, appropriate faculty, or academic facilities are unavailable to meet standards.

Precedence Statement

The *School of Engineering Technology Bulletin* contains the University's primary statements about

these academic programs and degree requirements, as authorized by the president or Board of Trustees. For information about other academic policies and procedures; student responsibilities, academic and extracurricular life; faculty rights and responsibilities; or general personnel policies, benefits, and services, please refer to the *Academic Operations Manual*, *Undergraduate and Graduate Student Handbook*, *Cooperative Education Handbook*, *Faculty Handbook*, *Benefits and Services Handbook*, and related procedural guides as appropriate.

Tuition and Fees Policy

Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the president and the Board of Trustees at any time.

Photography: J. D. Levine and Russ Sparkman

Northeastern University

Publications

01.94.25

